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Baseline Soil and Groundwater Quality Assessment Seattle City Light Long-Term Lease Option Seattle, Washington

Prepared for

Boeing Environmental Affairs
Seattle, Washington

May 1990

Prepared by

WESTON
MANAGERS DESIGNERS/CONSULTANTS

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BASELINE SOIL AND GROUNDWATER QUALITY ASSESSMENT
SEATTLE CITY LIGHT LONG-TERM LEASE OPTION
SEATTLE, WASHINGTON

Prepared for

Boeing Environmental Affairs
Seattle, Washington

WO 3709-04-01
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**BASELINE SOIL AND GROUNDWATER QUALITY ASSESSMENT
SEATTLE CITY LIGHT LONG-TERM LEASE OPTION
SEATTLE, WASHINGTON**

1.0 INTRODUCTION

This report contains Roy F. Weston Inc.'s (WESTON's) findings from the baseline soil and groundwater quality assessment for the Seattle City Light (SCL) long-term lease option. The work was accomplished in accordance with our proposal dated 10 April 1990, and as modified by The Boeing Company (Boeing) and WESTON during the course of the field work.

1.1 Background

Boeing is evaluating an option to enter into a 50-year lease agreement with SCL on property adjoining SCL's Duwamish substation at 10000 West Marginal Place South. The undeveloped property is located on the Duwamish Waterway in Seattle, Washington (Figure 1).

We understand that the property was undeveloped in the 1930s (as indicated by aerial photographs) and that Corps of Engineers' records indicate that dredged sediment from the Duwamish Waterway was placed across the property in 1968. We also understand that dredged sediment was placed in the east-central portion of the property in 1985 from dredging of the Duwamish Yacht Club marina located north of the property.

Analysis of soil samples collected from the 1968 fill on SCL property immediately north of the lease option indicates that polychlorinated biphenyls (PCBs) and pentachlorophenols (PCPs) were undetected (i.e., below 0.01 ppm), that the samples were not state dangerous waste for halogenated hydrocarbons or polycyclic aromatic hydrocarbons (PAHs), and that they were not EP toxic for metals (Raven Systems & Research, Inc., 30 December 1987). Analysis of a composite soil sample from the 1985 dredge fill on the lease option revealed concentrations of 0.05 mg/kg PCBs and less than 10 mg/kg halogenated hydrocarbons. The 1985 dredge fill sample also contained less than state-regulated concentrations of PAHs and was not EP toxic for metals (Laucks Testing Laboratory, Laboratory No. 90364, 18 July 1985).

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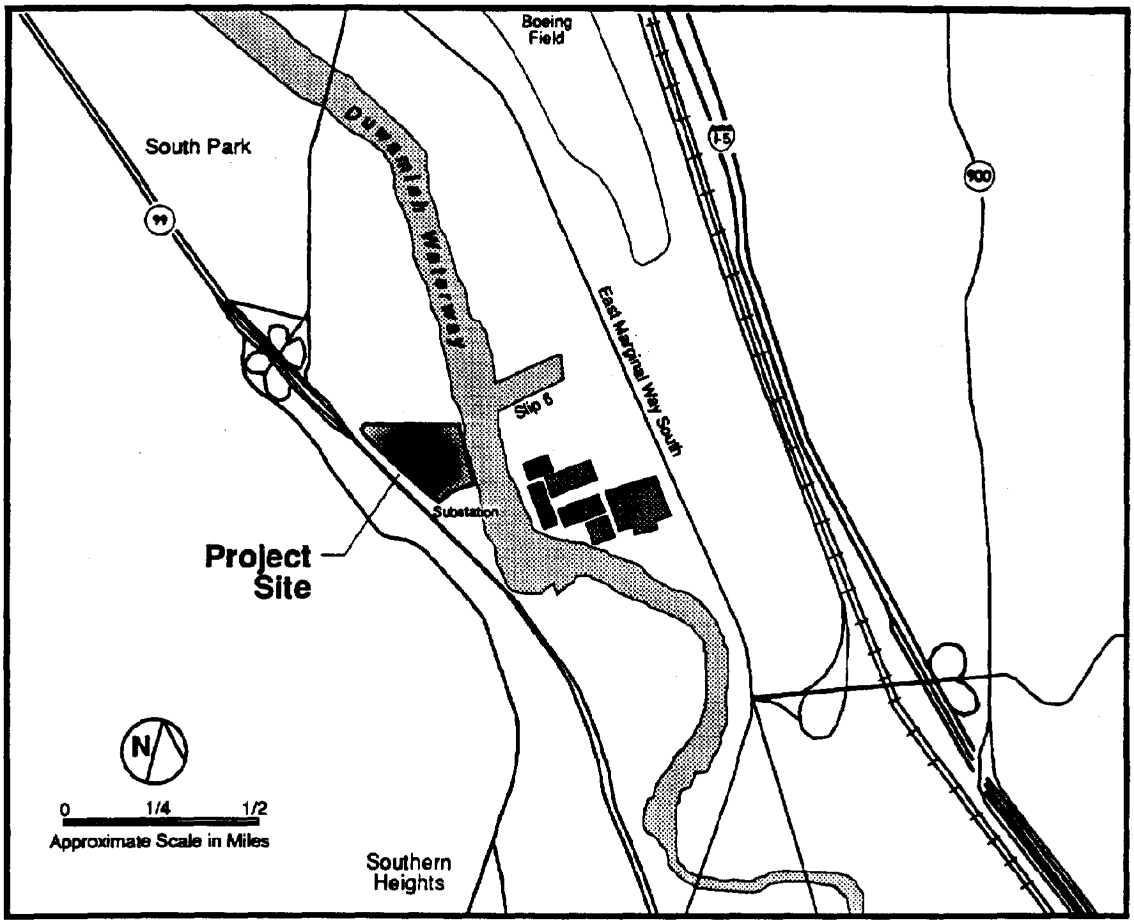
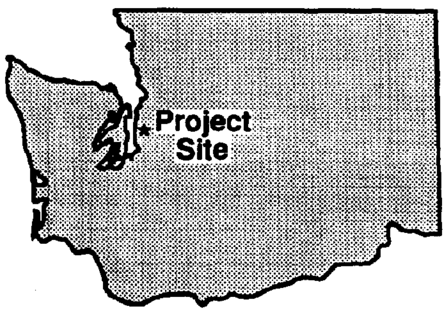


Vicinity Map



Washington State

Project Site Locator Map

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Figure
1

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1.2 Purpose and Objectives

The purpose of this work is to support Boeing's due diligence effort in assessing the property and to provide a baseline for comparing and assessing soil and groundwater quality conditions at the property after lease termination. The purpose of the sampling and analytical program strategy was to minimize the overall number of media samples, while maximizing the likelihood of detection of organic compounds or metals in each media.

The soil and groundwater quality assessment was designed to achieve the following objectives:

- Assess soil quality along the fence line of the substation for PCBs and chlorinated herbicides based on their potential use at the substation and potential migration onto the lease property.

- Assess soil quality in the 1968 dredge fill for arsenic, barium, cadmium, chromium, lead, mercury, selenium, sliver, copper, tin, and PAHs. These parameters were selected based on the prevalent contaminants identified elsewhere in the Duwamish Waterway area. Copper and tin were included because of their potential adverse affects on aquatic life.

- Assess soil quality in the 1985 dredge fill for the ten metals, semivolatile organic compounds, and PCBs. The full semivolatile scan (i.e., base/neutral/acid extractable fractions) was recommended based on typical practices/activities associated with marinas.

- Assess groundwater quality beneath the property for volatile organic compounds (VOCs) and conventional water quality parameters. Groundwater was analyzed for VOCs to assess potential releases of fuels or solvents from the substation or other off-site sources and/or from the dredge fill. Conventional parameters were sampled to assess baseline conditions and the influence, if any, of seawater from the waterway.

1.3 Summary of Findings

Seven soil borings (6 to 20 feet deep) were drilled and sampled on the property on 17 and 18 April 1990. Composite soil samples from each boring were analyzed for PAHs and metals. Samples from the 1985 dredge fill area were additionally analyzed for PCBs. Low levels of a few PAHs and several metals were detected in the soil samples at concentrations below the most stringent applicable regulations (i.e., draft Washington Model Toxics Control Act Cleanup Regulations). PCBs were not detected in the 1985 dredge fill samples.

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Three of the borings were completed as monitoring wells. The wells were sampled for groundwater and analyzed for VOCs and selected conventional groundwater quality parameters. Acetone, present at a very low concentration in one well, was the only VOC detected in the samples.

Five composite surface soil samples were collected along the substation fence line and analyzed for PCBs and chlorinated herbicides. Neither PCBs nor herbicides were detected in any of the samples at detection limits that were well below regulatory clean-up levels.

No regulated concentrations of organic compounds or metals were detected in samples from the property. The low levels of PAHs and metals present in some of the samples are probably representative of background concentrations in dredge fill in the Duwamish industrial area.

No further sampling at the property is recommended.

WESTON performed this work and prepared this report in accordance with generally accepted professional practices, related to the nature of the work accomplished, for the exclusive use of Boeing for the specific application to the proposed SCL property. No other warranty, expressed or implied, is made.

2.0 SITE ASSESSMENT

2.1 General Property Description

The property comprises approximately 20 acres of open grassy field. It is bounded to the south by SCL's Duwamish substation, to the north by the Delta Marine Industries facilities, to the east by the Duwamish Waterway, and to the west by West Marginal Place South, a frontage road of Highway 99 (Figure 2). The west and south portions of the property are crossed by several high-voltage power lines. An open ditch runs along the west boundary of the property. Photographs of the property are included in Appendix C.

The majority of the property is nearly level. A rectangular depression, approximately 200 feet on a side, is located in the east-central portion of the lease property. The depression apparently marks the area filled with dredged sediment in 1985. The depression appears to be an infilled impoundment in which dredged sediment was placed and allowed to drain.

An area of seasonally ponded water was located in the central portion of the property and noticeably decreased in size during the course of the site investigation.

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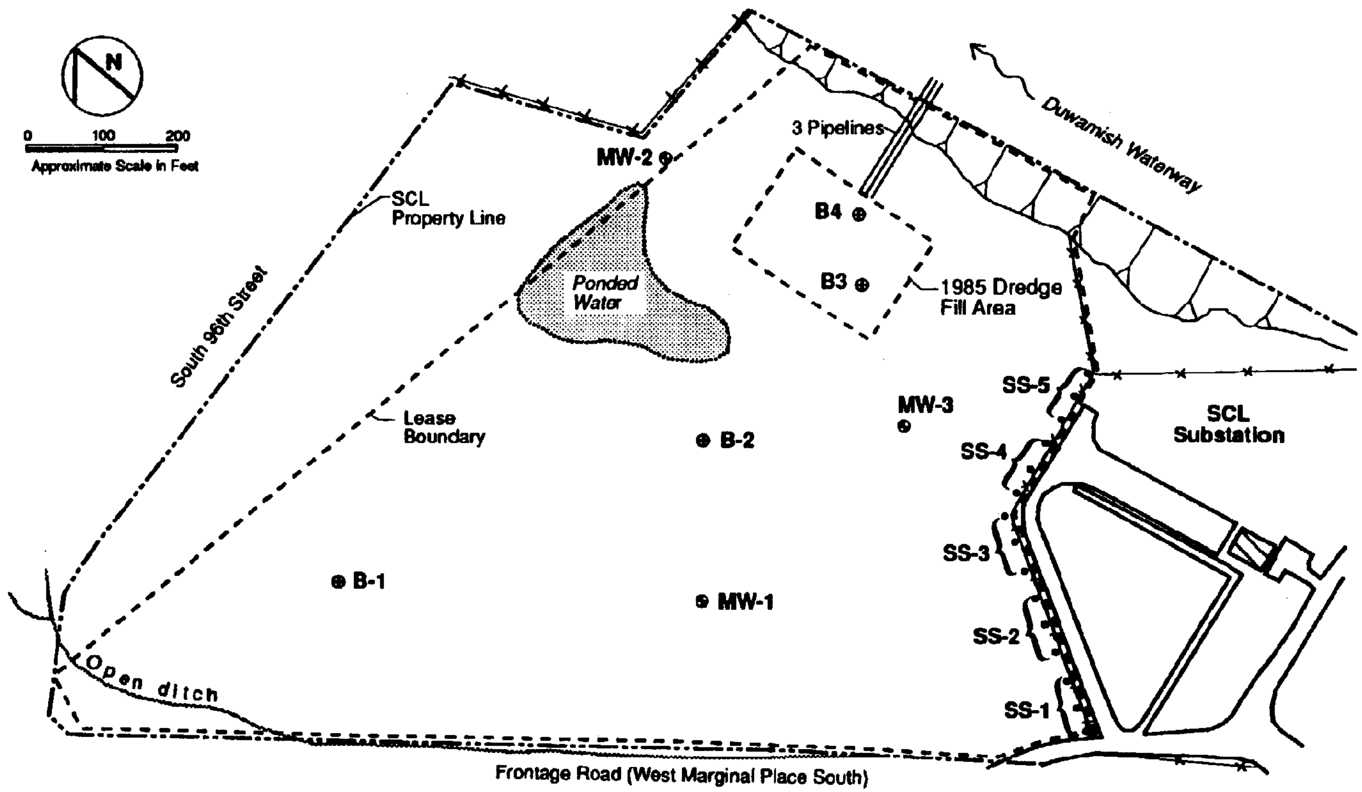

Explanation

⊕	B-1	Hand Auger boring location
⊕	MW-1	Monitoring well location
•	SS-1	Surface soil sample location

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Site Map and Sampling Locations

FIGURE
2

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The easternmost portion of the property along the Duwamish Water contains several exposures of milled lumber debris mixed with sandy and clayey silt fill. The lumber-containing fill appears to be a separate fill unit from the 1968 or 1985 fills, although this is uncertain because the relationship between the fill units along the waterway is obscured by vegetation and recent sedimentation. Several decayed pilings are present along the waterway shoreline.

2.2 Subsurface Stratigraphy

Seven soil borings were drilled on the property (Figure 2). Three of the borings, designated MW-1 through MW-3, were drilled to a depth of approximately 20 feet using a mechanical drill rig and were completed as monitoring wells on 17 April 1990. Four of the borings, designated B-1 through B-4, were drilled to depths of 6 to 10 feet using hand-auger techniques. Borings B-3 and B-4 were located in the 1985 dredge fill area. All of the other borings were completed in the 1968 dredge fill area. A discussion of drilling, sampling, and decontamination procedures used at the site are provided in Appendix A. Exploration logs of the borings are also presented in Appendix A.

The subsurface investigation indicates that the property is underlain by approximately 5 to 10 feet of stratified, heterogeneous fill that, in turn, overlies alluvium of the Duwamish River floodplain (Figure 3). Apart from the man-made levee along the present bank of the Duwamish Waterway, the fill appears to thicken progressively westward across the property. The fill is thinnest (5.5 to 6.2 feet) in the topographic depression in the east portion of the property that apparently coincides with the limits of the 1985 dredge fill.

Relatively little lithologic or textural difference was noted between the 1968 and 1985 fills. The fill is composed predominantly of crudely layered silty sand and clayey silt. The upper 1 to 4 feet of the fill is typically a loose to medium-dense, moist, brown, silty sand. Dense, black, carbonaceous, fine sand and stiff, black, clayey silt typically occur beneath the surface layer. The black sand and silt often contain abundant wood fragments. In some borings, a saturated, gray, well-graded sand layer 0 to 4 feet thick occurs at or near the base of the fill.

Fill overlying alluvium was also observed in an eroded exposure along the west bank of the Duwamish Waterway. Very abundant milled lumber debris occurs in a sandy to clayey matrix at low elevations along the bank and may be a separate fill unit from the 1968 and 1985 dredge fill units described here.

Alluvium underlying the fill consists of approximately 2 to 3 feet of gray, mottled, massive, clayey silt that often contains plant fragments. Below the mottled clayey silt is a 1.5- to 4-foot-thick unit composed of thinly bedded, gray and brown, clayey silt and fine sand. In the three deepest borings, (i.e., MW-1, MW-2, and MW-3), a

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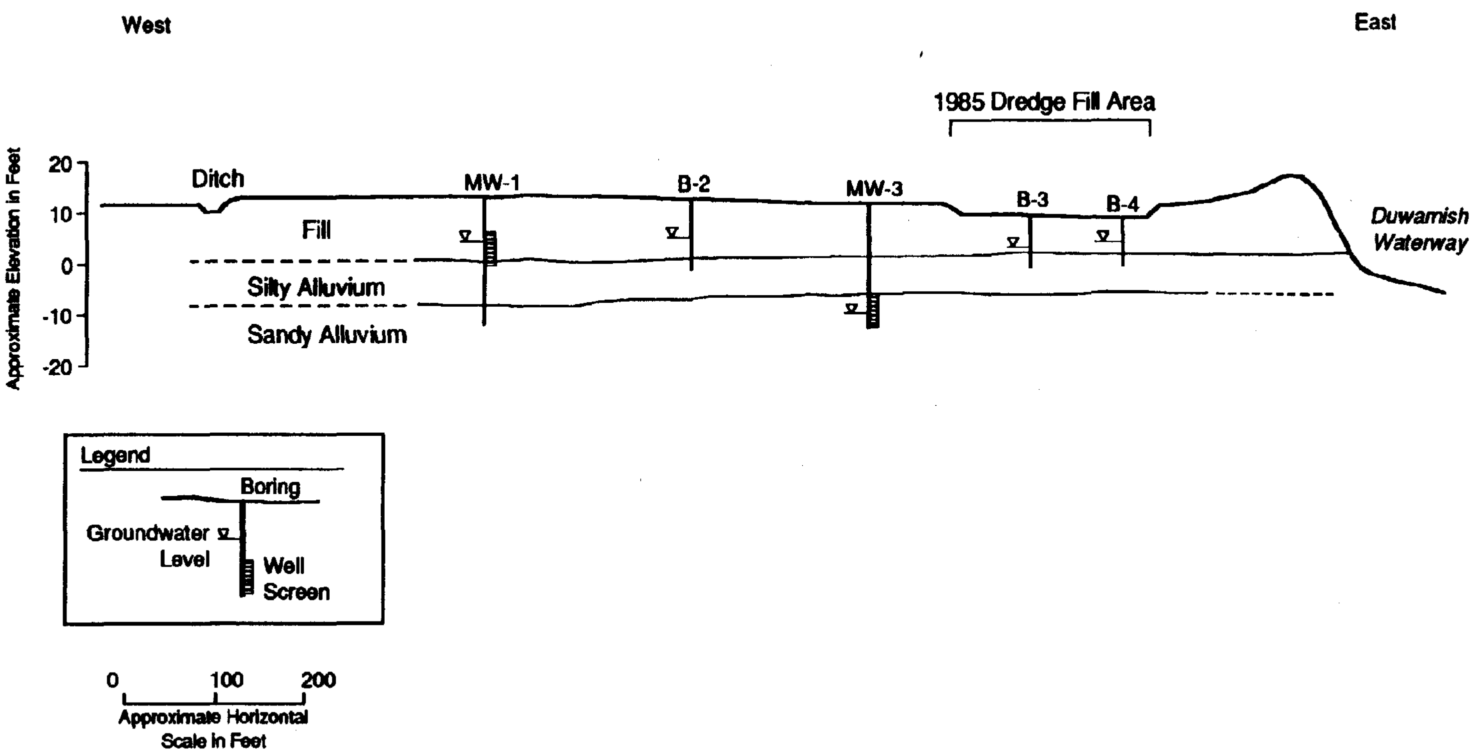

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Subsurface Geologic Section
Seattle City Light Lease Option

Figure
3

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minimum of 3 to 7 feet of saturated, gray sand is present at the base of the explorations. The total thickness of this sand unit at the site is not known because it was not fully penetrated by any of the borings. The alluvium is interpreted to be fine-grained bioturbated and stratified overbank deposits and coarser channel sands of the Duwamish River.

2.3 Groundwater

Groundwater was encountered in all seven borings. A discontinuous, water-bearing zone occurred within the lower portion of the fill unit in Borings MW-1, B-1, B-2, B-3, and B-4. Depth to water varies from 3 to 6.5 feet below ground surface. This upper water-bearing zone results from the contrasting permeability of the fill sand and the underlying fine-grained unit that retards downward migration of groundwater. The water-bearing zone within the fill immediately overlies the massive, mottled, clayey silt unit of the native alluvium. Well MW-1 is screened across this water-bearing zone within the fill. Water-bearing zones within the fill were not observed in the borings for Wells MW-2 and MW-3.

A second water-bearing zone occurs within the sand unit that is located below a depth of approximately 13 feet in the sandy alluvium. This deeper water-bearing zone extends beneath the property and may be in hydraulic communication with the Duwamish Waterway. Wells MW-2 and MW-3 are both screened within this unit. Depth to water in this unit varied from 11.6 feet at Well MW-2 to 15.8 feet at Well MW-3. Groundwater flow direction in this unit could not be determined because three water level measurement points were not available. Groundwater flow at the site is most likely northeastward towards the Duwamish Waterway.

Based on the difference in water levels between Well MW-1 and Wells MW-2 and MW-3, the saturated zones within the fill and the alluvium do not appear to be connected.

2.4 Sampling Along the SCL Substation Fence Line

Five composite surface samples were collected along the north side of the fence separating the SCL substation from the lease option property. A discussion of the specific sampling and decontamination procedures used is provided in Appendix A.

The ground surface along the fence line is covered with approximately 2 to 4 inches of clean, coarse gravel. The underlying soil consisted of grayish brown, slightly silty sand fill. No staining of or odors from the soil were noted during sampling. Analytical results for the samples are presented in Section 3.

3.0 ANALYTICAL RESULTS

All samples were analyzed by Laucks Testing Laboratories, Seattle, Washington. Complete analytical results are presented in Appendix B and Tables 1 through 8. A summary of those analytes detected is presented in Table 9.

3.1 1968 Dredge Fill Area

Subsurface soil samples composited from the five borings in the 1968 dredge fill area (i.e., Borings MW-1, MW-2, MW-3, B-1, and B-2) were analyzed for PAHs and metals. The high molecular weight PAH compound benzo(a)pyrene was detected in three of the five boring samples (MW-1, MW-3, and B-1) at concentrations of 96 to 340 ug/kg. Pyrene was detected in only one boring sample (MW-3) at a concentration of 74 ug/kg. Bis(2-ethylhexyl)phthalate was detected in all five boring samples at concentrations of 87 to 490 ug/kg. No other base/neutral-extractable semivolatile compounds were detected in the composite samples from each boring.

Several metals were detected in each of the five boring samples. Metal concentrations in the samples are well within the ranges observed in natural soils by WESTON personnel in the Puget Sound region.

3.2 1985 Dredge Fill Area

Subsurface soil samples composited from the two borings in the 1985 dredge fill area (i.e., Borings B-3 and B-4) were analyzed for PCBs, semivolatile organic compounds, and metals. PCBs were not found in the samples at detection limits that range from 80 to 210 ug/kg. The PAH compounds fluoranthene (70 ug/kg), phenanthrene (53 ug/kg), pyrene (86 ug/kg), and benzo(a)pyrene (250 ug/kg) were detected in the sample from Boring B-3. Bis(2-ethylhexyl)phthalate was detected in the samples from both borings at concentrations of 440 and 380 ug/kg. No other semivolatile organic compound was detected in the sample from Boring B-4. Several metals were detected in the two boring samples. The concentration of mercury in the sample from Boring B-3 (0.51 ug/kg) appears to be slightly elevated with respect to the typical range found in natural soils of the Puget Sound region. All other metal concentrations in the two samples are well within the ranges observed in natural soils by WESTON personnel in the Puget Sound region.

3.3 Groundwater

The three groundwater samples collected from Wells MW-1, MW-2, and MW-3 on 26 April 1990 were analyzed for VOCs and selected conventional water quality parameters (i.e., alkalinity, chloride, sulfate, sodium, iron, manganese). The only VOC detected in any of the water samples was acetone, at a concentration of 8 ug/l in Well MW-1.

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TABLE 1
SUBSURFACE SOIL SAMPLES – TOTAL METALS
1968 AND 1985 DREDGE FILL AREAS
SEATTLE CITY LIGHT LEASE OPTION

Analyte	Sample*						
	MW-1	MW-2	MW-3	B-1	B-2	B-3	B-4
Arsenic	4.9	4.2	7.5	5.9	4.8	8.7	5.6
Barium	50.0	76.0	67.0	56.0	42.0	74.0	50.0
Cadmium	1.0	1.3	1.3	0.9	0.5 u	1.2	0.6
Chromium	15.0	17.0	20.0	13.0	12.0	18.0	13.0
Copper	20.0	36.0	36.0	19.0	17.0	33.0	20.0
Lead	7.3	15.0	16.0	8.7	8.2	17.0	7.4
Mercury	0.1 u	0.1 u	0.24	0.1 u	0.1 u	0.51	0.1 u
Selenium	0.5 u	0.5 u	0.8	0.5	0.5 u	0.5 u	0.5 u
Silver	1.0 u	1.0 u	1.0 u	1.0 u	1.0 u	1.0 u	1.0 u
Tin	50.0 u	50.0 u	50.0 u	50.0 u	50.0 u	50.0	50.0 u

*Parts per million (mg/kg), dry basis.
u – indicates the analyte of interest was not detected,
to the limit of detection shown.

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TABLE 2
SUBSURFACE SOIL SAMPLES – PAHs
(Base/Neutral Fractions of Semivolatile Extractables)
1968 DREDGE FILL AREA
SEATTLE CITY LIGHT LEASE OPTION

Analyte	Sample*									
	MW-1		MW-2		MW-3		B-1		B-2	
Aniline	200	u	210	u	230	u	220	u	210	u
Bis(2-Chloroethyl)Ether	39	u	43	u	45	u	43	u	41	u
1,3-Dichlorobenzene	39	u	43	u	45	u	43	u	41	u
1,4-Dichlorobenzene	39	u	43	u	45	u	43	u	41	u
1,2-Dichlorobenzene	39	u	43	u	45	u	43	u	41	u
Bis(2-Chloroisopropyl)Ether	39	u	43	u	45	u	43	u	41	u
N-Nitroso-Di-n-Propylamine	39	u	43	u	45	u	43	u	41	u
Hexachloroethane	79	u	86	u	90	u	87	u	83	u
Nitrobenzene	39	u	43	u	45	u	43	u	41	u
Isophorone	39	u	43	u	45	u	43	u	41	u
Bis(2-Chloroethoxy)Methane	39	u	43	u	45	u	43	u	41	u
1,2,4-Trichlorobenzene	39	u	43	u	45	u	43	u	41	u
Naphthalene	79	u	86	u	90	u	87	u	83	u
4-Chloroaniline	39	u	43	u	45	u	43	u	41	u
Hexacholrobutadiene	39	u	43	u	45	u	43	u	41	u
2-Methylnaphthalene	39	u	43	u	45	u	43	u	41	u
Hexachlorocyclopentadiene	79	u	86	u	90	u	87	u	83	u
2-Chloronaphthalene	39	u	43	u	45	u	43	u	41	u
2-Nitroaniline	79	u	86	u	90	u	87	u	83	u
Dimethyl Phthalate	39	u	43	u	45	u	43	u	41	u
Acenaphthylene	39	u	43	u	45	u	43	u	41	u
2,6-Dinitrotoluene	79	u	86	u	90	u	87	u	83	u
3-Nitroaniline	200	u	210	u	230	u	220	u	210	u
Ancaphthene	39	u	43	u	45	u	43	u	41	u
Dibenzofuran	39	u	43	u	45	u	43	u	41	u
2,4-Dinitrotoluene	79	u	86	u	90	u	87	u	83	u

*Parts per million (mg/kg), dry basis.
u – indicates the analyte of interest was not detected,
to the limit of detection shown.

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TABLE 2 *(Continued)*
SUBSURFACE SOIL SAMPLES – PAHs
(Base/Neutral Fractions of Semivolatile Extractables)
1968 DREDGE FILL AREA
SEATTLE CITY LIGHT LEASE OPTION

Analyte	Sample* MW-1		MW-2		MW-3		B-1		B-2	
Diethyl Phthalate	39	u	43	u	45	u	43	u	41	u
4-Chlorophenyl-Phenylether	39	u	43	u	45	u	43	u	41	u
Fluorene	39	u	43	u	45	u	43	u	41	u
4-Nitroaniline	79	u	86	u	90	u	87	u	83	u
N-Nitrosodiphenylamine	39	u	43	u	45	u	43	u	41	u
1,2-Diphenylhydrazine	79	u	86	u	90	u	87	u	83	u
4-Bromophenyl-Phenylether	79	u	86	u	90	u	87	u	83	u
Hexachlorobenzene	39	u	43	u	45	u	43	u	41	u
Phenanthrene	39	u	43	u	45	u	43	u	41	u
Anthracene	39	u	43	u	45	u	43	u	41	u
Di-n-Butyl Phthalate	39	u	43	u	45	u	43	u	41	u
Fluoranthene	39	u	43	u	45	u	43	u	41	u
Pyrene	39	u	43	u	74		43	u	41	u
Benzidine	980	u	1100	u	1100	u	1100	u	1100	u
Butylbenzylphthalate	39	u	43	u	45	u	43	u	41	u
3,3'Dichlorobenzidine	390	u	430	u	450	u	430	u	410	u
Benzo(a)Anthracene	39	u	43	u	45	u	43	u	41	u
Chrysene	39	u	43	u	45	u	43	u	41	u
Bis(2-Ethylhexyl)Phthalate	87		160		340		390		490	
Di-n-Octyl Phthalate	39	u	43	u	45	u	43	u	41	u
Benzo(b)Fluoranthene	79	u	86	u	90	u	87	u	83	u
Benzo(k)Fluoranthene	79	u	86	u	90	u	87	u	83	u
Benzo(a)Pyrene	96		86	u	340		140		83	u
Indeno(1,2,3-cd)Pyrene	79	u	86	u	90	u	87	u	83	u
Dibenzo(a,h)Anthracene	79	u	86	u	90	u	87	u	83	u
Benzo(g,h,i)Perylene	79	u	86	u	90	u	87	u	83	u

*Parts per billion (ug/kg), dry basis.
u – Analyte of interest was not detected, to the limit of detection shown.

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TABLE 3
SUBSURFACE SOIL SAMPLES – SEMIVOLATILE ORGANIC COMPOUNDS
(Base/Neutral/Acid Fractions of Semivolatile Extractables)
1985 DREDGE FILL AREA
SEATTLE CITY LIGHT LEASE OPTION

Analyte	Sample*			
	B-3		B-4	
Phenol	44	u	43	u
Aniline	220	u	220	u
Bis(2-Chloroethyl)Ether	44	u	43	u
2-Chlorophenol	44	u	43	u
1,3-Dichlorobenzene	44	u	43	u
1,4-Dichlorobenzene	44	u	43	u
Benzyl Alchohol	44	u	43	u
1,2-Dichlorobenzene	44	u	43	u
2-Methylphenol	44	u	43	u
Bis(2-Chloroisopropyl)Ether	44	u	43	u
4-Methylphenol	44	u	43	u
N-Nitroso-Di-n-Propylamine	44	u	43	u
Hexachloroethane	89	u	87	u
Nitrobenzene	44	u	43	u
Isophorone	44	u	43	u
2-Nitrophenol	89	u	87	u
2,4-Dimethylphenol	44	u	43	u
Benzoic Acid	1100	u	1100	u
Bis(2-Chloroethoxy)Methane	44	u	43	u
2,4-Dichlorophenol	89	u	87	u
1,2,4-Trichlorobenzene	44	u	43	u
Naphthalene	89	u	87	u
4-Chloroaniline	44	u	43	u
Hexachlorbutadiene	44	u	43	u
4-Chloro-3-Methylphenol	89	u	87	u
2-Methylnaphthalene	44	u	43	u
Hexachlorocyclopentadiene	89	u	87	u

*Parts per billion (ug/kg), dry basis.
u – Analyte of interest was not detected, to the limit of detection shown.

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TABLE 3 *(Continued)*
SUBSURFACE SOIL SAMPLES – SEMIVOLATILE ORGANIC COMPOUNDS
(Base/Neutral/Acid Fractions of Semivolatile Extractables)
1985 DREDGE FILL AREA
SEATTLE CITY LIGHT LEASE OPTION

Analyte	Sample* B-3		Sample* B-4	
2,4,6-Trichlorophenol	89	u	87	u
2,4,5-Trichlorophenol	89	u	87	u
2-Chloronaphthalene	44	u	43	u
2-Nitroaniline	89	u	87	u
Dimethyl Phthalate	44	u	43	u
Acenaphthylene	44	u	43	u
2,6-Dinitrotoluene	89	u	87	u
3-Nitroaniline	220	u	220	u
Acenaphthene	44	u	43	u
2,4-Dinitrophenol	440	u	430	u
4-Nitrophenol	440	u	430	u
Dibenzofuran	44	u	43	u
2,4-Dinitrotoluene	89	u	87	u
Diethyl Phthalate	44	u	43	u
4-Chlorophenyl-Phenylether	44	u	43	u
Fluorene	44	u	43	u
4-Nitroaniline	89	u	87	u
4,6-Dinitro-2-Methylphenol	440	u	430	u
N-Nitrosodiphenylamine	44	u	43	u
1,2-Diphenylhydrazine	89	u	87	u
4-Bromophenyl-Phenylether	89	u	87	u
Hexachlorobenzene	44	u	43	u
Pentachlorophenol	440	u	430	u
Phenanthrene	53		43	u
Anthracene	44	u	43	u
Di-n-Butyl Phthalate	44	u	43	u

*Parts per billion (ug/kg), dry basis.
u – Analyte of interest was not detected, to the limit of detection shown.

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TABLE 3 *(Continued)*

SUBSURFACE SOIL SAMPLES – SEMIVOLATILE ORGANIC COMPOUNDS
(Base/Neutral/Acid Fractions of Semivolatile Extractables)
1985 DREDGE FILL AREA
SEATTLE CITY LIGHT LEASE OPTION

Analyte	Sample*	
	B-3	B-4
Fluoranthene	70	43 u
Pyrene	86	743 u
Benzidine	1100 u	1100 u
Butylbenzylphthalate	44 u	43 u
3,3'Dichlorobenzidine	440 u	430 u
Benzo(a)Anthracene	44 u	43 u
Chrysene	44 u	43 u
Bis(2-Ethylhexyl)Phthalate	440	380
Di-n-Octyl Phthalate	44 u	43 u
Benzo(b)Fluoranthene	89 u	87 u
Benzo(k)Fluoranthene	89 u	87 u
Benzo(a)Pyrene	250	87 u
Indeno(1,2,3-cd)Pyrene	89 u	87 u
Dibenzo(a,h)Anthracene	89 u	87 u
Benzo(g,h,i)Perylene	89 u	87 u

*Parts per billion (ug/kg), dry basis.
u – Analyte of interest was not detected, to the limit of detection shown.

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TABLE 4
SURFACE SOIL SAMPLES – PESTICIDES AND PCBs
1985 DREDGE FILL AREA
SEATTLE CITY LIGHT LEASE OPTION

Analyte	Sample* B-3		Sample* B-4	
alpha-BHC	11.0	u	10.0	u
beta-BHC	11.0	u	10.0	u
delta-BHC	11.0	u	10.0	u
gamma-BHC (lindane)	11.0	u	10.0	u
Heptachlor	11.0	u	10.0	u
Aldrin	11.0	u	10.0	u
Heptachlor epoxide	11.0	u	10.0	u
Endosulfan I	11.0	u	10.0	u
Dieldrin	21.0	u	21.0	u
4,4'-DDE	21.0	u	21.0	u
Endrin	21.0	u	21.0	u
Endosulfan II	21.0	u	21.0	u
4,4'-DDD	21.0	u	21.0	u
Endosulfan sulfate	21.0	u	21.0	u
4,4'-DDT	21.0	u	21.0	u
Methoxychlor	110.0	u	100.0	u
Endrin ketone	21.0	u	21.0	u
alpha-Chlordane	110.0	u	100.0	u
gamma-Chlordane	110.0	u	100.0	u
Toxaphene	210.0	u	210.0	u
Arochlor-1016	110.0	u	100.0	u
Arochlor-1221	110.0	u	100.0	u
Arochlor-1232	110.0	u	100.0	u
Arochlor-1242	110.0	u	100.0	u
Arochlor-1248	110.0	u	100.0	u
Arochlor-1254	210.0	u	210.0	u
Arochlor-1260	210.0	uu	210.0	u

*Parts per billion (ug/kg), dry basis.
u – Analyte of interest was not detected, to the limit of detection shown.

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SEA290335

TABLE 5
GROUNDWATER SAMPLES – VOLATILE ORGANIC COMPOUNDS
SEATTLE CITY LIGHT LEASE OPTION

Analyte	Sample* MW-1	MW-2	MW-3
Chloromethane	1 u	1 u	1 u
Bromomethane	1 u	1 u	1 u
Vinyl Chloride	1 u	1 u	1 u
Chloroethane	3 u	3 u	3 u
Methylene Chloride	1 u	1 u	1 u
Acetone	8	5 u	5 u
Carbon Disulfide	1 u	1 u	1 u
1,1-Dichloroethene	1 u	1 u	1 u
1,1-Dichloroethane	1 u	1 u	1 u
Trans-1,2-Dichloroethene	1 u	1 u	1 u
Cis-1,2-Dichloroethene	1 u	1 u	1 u
Total 1,2-Dichloroethene	1 u	1 u	1 u
Chloroform	1 u	1 u	1 u
2-Butanone	3 u	3 u	3 u
1,2-Dichloroethane	1 u	1 u	1 u
1,1,1-Trichloroethane	1 u	1 u	1 u
Carbon Tetrachloride	1 u	1 u	1 u
Vinyl Acetate	1 u	1 u	1 u
Bromodichloromethane	1 u	1 u	1 u
1,2-Dichloropropane	1 u	1 u	1 u
Trichloroethene	1 u	1 u	1 u
Benzene	1 u	1 u	1 u
Dibromochloromethane	3 u	3 u	3 u
1,1,2-Trichloroethane	1 u	1 u	1 u
Bromoform	1 u	1 u	1 u
4-Methyl-2-Pentanone	3 u	3 u	3 u
2-Hexanone	3 u	3 u	3 u
1,1,2,2-Tetrachloroethane	3 u	3 u	3 u
Tetrachloroethene	1 u	1 u	1 u
Toluene	1 u	1 u	1 u
Chlorobenzene	3 u	3 u	3 u
Trans-1,3-Dichloropropene	3 u	3 u	3 u
Ethylbenzene	1 u	1 u	1 u
Cis-1,3-Dichloropropene	3 u	3 u	3 u
Stryrene	1 u	1 u	1 u
Total Xylene	1 u	1 u	1 u

* Results in ug/L
u – indicates the analyte of interest was not detected, to the limit of detection shown.

TABLE 6
GROUNDWATER SAMPLES – CONVENTIONAL PARAMETERS
SEATTLE CITY LIGHT LEASE OPTION

Analyte	Sample*		
	MW–1	MW–2	MW–3
Chloride	150.0	1400.0	19.0
Iron	4.8	30.0	6.0
Managanese	0.30	3.8	0.23
Sodium	440.0	1300.0	210.0
Sulfate as SO4	43.0	3.0	15.0
Total Alkalinity as CaCO3	690.0	1100.0	310.0

* Results in mg/L

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TABLE 7
SURFACE SOIL SAMPLES – PESTICIDES AND PCBs
SUBSTATION FENCE LINE AREA
SEATTLE CITY LIGHT LEASE OPTION

Analyte	Sample*				
	SS-1	SS-2	SS-3	SS-4	SS-5
alpha-BHC	8.7 u	8.7 u	8.8 u	8.6 u	8.6 u
beta-BHC	8.7 u	8.7 u	8.8 u	8.6 u	8.6 u
delta-BHC	8.7 u	8.7 u	8.8 u	8.6 u	8.6 u
gamma-BHC (lindane)	8.7 u	8.7 u	8.8 u	8.6 u	8.6 u
Heptachlor	8.7 u	8.7 u	8.8 u	8.6 u	8.6 u
Aldrin	8.7 u	8.7 u	8.8 u	8.6 u	8.6 u
Heptachlor epoxide	8.7 u	8.7 u	8.8 u	8.6 u	8.6 u
Endosulfan I	8.7 u	8.7 u	8.8 u	8.6 u	8.6 u
Dieldrin	17.0 u	17.0 u	18.0 u	17.0 u	17.0 u
4,4'-DDE	17.0 u	17.0 u	18.0 u	17.0 u	17.0 u
Endrin	17.0 u	17.0 u	18.0 u	17.0 u	17.0 u
Endosulfan II	17.0 u	17.0 u	18.0 u	17.0 u	17.0 u
4,4'-DDD	17.0 u	17.0 u	18.0 u	17.0 u	17.0 u
Endosulfan sulfate	17.0 u	17.0 u	18.0 u	17.0 u	17.0 u
4,4'-DDT	17.0 u	17.0 u	18.0 u	17.0 u	17.0 u
Methoxychlor	87.0 u	87.0 u	88.0 u	86.0 u	86.0 u
Endrin ketone	17.0 u	17.0 u	18.0 u	17.0 u	17.0 u
alpha-Chlordane	87.0 u	87.0 u	88.0 u	86.0 u	86.0 u
gamma-Chlordane	87.0 u	87.0 u	88.0 u	86.0 u	86.0 u
Toxaphene	170.0 u	170.0 u	180.0 u	170.0 u	170.0 u
Arochlor-1016	87.0 u	87.0 u	88.0 u	86.0 u	86.0 u
Arochlor-1221	87.0 u	87.0 u	88.0 u	86.0 u	86.0 u
Arochlor-1232	87.0 u	87.0 u	88.0 u	86.0 u	86.0 u
Arochlor-1242	87.0 u	87.0 u	88.0 u	86.0 u	86.0 u
Arochlor-1248	87.0 u	87.0 u	88.0 u	86.0 u	86.0 u
Arochlor-1254	170.0 u	170.0 u	180.0 u	170.0 u	170.0 u
Arochlor-1260	170.0 u	170.0 u	180.0 u	170.0 u	170.0 u

*Parts per billion (ug/kg), dry basis.
u – Analyte of interest was not detected, to the limit of detection shown.

SCL 04849

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SEA290338

TABLE 8
SURFACE SOIL SAMPLES – CHLORINATED HERBICIDES
SUBSTATION FENCE LINE AREA
SEATTLE CITY LIGHT LEASE OPTION

Analyte	Sample*				
	SS-1	SS-2	SS-3	SS-4	SS-5
2,4-D	11.0 u	11.0 u	11.0 u	11.0 u	11.0 u
2,4,5-T	5.4 u	5.5 u	5.5 u	5.5 u	5.4 u
2,4,5-TP	5.4 u	5.5 u	5.5 u	5.5 u	5.4 u

* Parts per billion (ug/kg), dry basis.
u – indicates the analyte of interest was not detected, to the limit of detection shown.

SCL 04850

CTY0049861

SEA290339

TABLE 9
SUMMARY OF ANALYTES DETECTED
SEATTLE CITY LIGHT LEASE OPTION

		Soil												Water		
Analyte	Units	MW-1	MW-2	MW-3	B-1	B-2	B-3	B-4	SS-1	SS-2	SS-3	SS-4	SS-5	MW-1	MW-2	MW-3
Volatile Organic Compounds																
Acetone	ug/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8	5u	5u
Semivolatile Compounds																
Fluoranthene	ug/kg	39u	43u	45u	43u	41u	70	43u	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	ug/kg	39u	43u	45u	43u	41u	53	43u	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl)phthalate	ug/kg	87	160	340	390	490	440	380	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	ug/kg	39u	43u	74	43u	41u	86	43u	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	ug/kg	96	86u	340	140	83u	250	87u	NA	NA	NA	NA	NA	NA	NA	NA
Metals																
Arsenic	mg/kg	4.9	4.2	7.5	5.9	4.8	8.7	5.6	NA	NA	NA	NA	NA	NA	NA	NA
Barium	mg/kg	50	76	67	56	42	74	50	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	mg/kg	1.0	1.3	1.3	0.9	0.5u	1.2	0.6	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	mg/kg	15	17	20	13	12	18	13	NA	NA	NA	NA	NA	NA	NA	NA
Copper	mg/kg	20	36	36	19	17	33	20	NA	NA	NA	NA	NA	NA	NA	NA
Lead	mg/kg	7.3	15	16	8.7	8.2	17	7.4	NA	NA	NA	NA	NA	NA	NA	NA
Mercury	mg/kg	0.1u	0.1u	0.24	0.1u	0.1u	0.51	0.1u	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	mg/kg	0.5u	0.5u	0.8	0.5	0.5u	0.5	0.5u	NA	NA	NA	NA	NA	NA	NA	NA
Conventional Paramenters																
Chloride	mg/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	150	1400	19
Sulfate	mg/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	43	3	15
Alkalinity	mg/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	690	1100	310
Iron	mg/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.8	30	6.0
Manganese	mg/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.30	3.8	0.23
Sodium	mg/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	440	1300	210

NA – Sample not analyzed for this analyte
u – Compound was not detected; associated value is the sample detection limit.

All of the conventional water quality parameters were detected at low to moderate concentrations. Chloride concentrations were highest at Well MW-2 (1400 mg/l) indicating brackish conditions in the native sand aquifer at that location and some influence from the saltwater wedge in the adjacent Duwamish Waterway. Iron, manganese, sodium, and total alkalinity are also highest at Well MW-2. Field measurements indicate the groundwater has a pH of 7.0 to 7.1.

3.4 SCL Substation Fence Line Area

The five surface soil samples collected along the SCL substation fence line were analyzed for pesticides, PCBs, and three chlorinated herbicides. The five samples did not contain detectable concentrations of any of these compounds at detection limits of 8.6 to 180 ug/kg for pesticides, 86 to 170 ug/kg for PCBs, and 5.4 to 11.0 ug/kg for herbicides.

4.0 DISCUSSION

4.1 1968 Dredge Fill Area

The 1968 dredge fill contained low concentrations of PAHs and metals. Total PAHs concentrations (140 to 414 ug/kg) in composite samples from the fill were below the draft soil clean-up levels for total carcinogenic PAHs specified in the Washington State Model Toxics Control Act (MTCA) Cleanup Regulations (1.0 mg/kg) (9 March 1990). These PAH concentrations are probably representative of background PAH concentrations of dredge fill in the Duwamish industrial area.

Total metals concentrations in the 1968 fill samples are well below draft MTCA soil clean-up levels and are at concentrations so low they will not fail EP toxicity criteria.

4.2 1985 Dredge Fill Area

The 1985 dredge fill also contained low concentrations of PAHs and metals. PCBs were not detected in either composite fill sample at detection limits that are well below the most stringent PCB clean-up standards. Several PAHs were detected in the composite soil sample from Boring B-3 at a total concentration of 549 ug/kg. Again, this concentration is below the draft MTCA clean-up standard for PAHs in soil.

Total metals concentrations in the 1985 fill samples were well below MTCA clean-up levels. Although the concentration of mercury (0.51 mg/kg) in the composite sample from Boring B-3 is slightly elevated above the typical range for natural soils, it is still below the draft MTCA clean-up level for mercury in soil (1.0 mg/kg).

4.3 Groundwater

No volatile organic compounds were detected in groundwater at the site, except acetone, at a very low concentration (8 ug/l) in the sample from Well MW-1. Acetone is a common laboratory contaminant and its presence in sample MW-1 may be a laboratory artifact, although it was not found in the associated laboratory blank.

Chloride, iron, and manganese concentrations (1,400 mg/L, 30 mg/L, 3.8 mg/L, respectively) at Well MW-2 exceed Washington secondary maximum contaminant levels (SMCLS) for these constituents (SMCLS: chloride = 250 mg/l; iron = 0.3 mg/l; manganese = 0.05 mg/l). The SMCLS for iron and manganese are also exceeded by samples from Wells MW-1 and MW-3.

4.4 SCL Substation Fence Line Area

PCBs, pesticides, and herbicides were not detected in composite surface soil samples collected from beneath decorative gravel along the substation fence line. The detection limits reported for these compounds are well below their respective regulatory clean-up levels. The fresh appearance of the decorative gravel along the fence line and the uniform nature of the sandy soil beneath suggests that they have been placed within the last few years.

5.0 RECOMMENDATIONS

Based on the results of the baseline soil and groundwater quality assessment, no further sampling at the SCL long-term lease option property is recommended.

Boeing should maintain a copy of this baseline report in appropriate files so that it is available for reference at the time of the lease termination.

Because 2-inch-diameter PVC monitoring wells are not anticipated to remain functional for the entire 50-year term of the lease, and because the risk of well damage during building construction is relatively high even with traffic protection posts in place, the three monitoring wells installed on the property should be abandoned in accordance with Chapter 173-160 of the Washington Administrative Code prior to the initiation of construction activities.

If the monitoring wells are left in place, any further groundwater sampling or well redevelopment should be conducted by qualified personnel.

APPENDIX A
FIELD PROCEDURES

The program of surface and subsurface explorations for this project included drilling three shallow mechanical auger borings completed as monitoring wells, advance and sampling of four hand-auger borings and collection of five surface samples. The results of our exploration program are presented on the exploration logs and well completion diagrams within this Appendix. The exploration logs are a representation of our interpretation of the drilling, sampling, and testing information. The depth where the soils or characteristics of the soils changed is illustrated. The change may be gradual.

Soil samples recovered in the explorations were visually classified (ASTM D 2488) in the field and described in general accordance with the method presented on Figure A-1 (ASTM D 2487). A explanation for the field exploration logs defining symbols and abbreviations utilized is also presented on Figure A-1.

The exploration locations are presented on Figure 1. The explorations were located in the field by hand taping or pacing from existing physical features. The approximate ground surface elevation at the exploration locations, as presented on the exploration logs, is an estimate.

Auger Borings

A total of three hollow-stem auger borings, designated MW-1 through MW-3, were drilled on 17 April 1990. The borings were completed to depths ranging from 19 to 20 feet below the ground surface. The borings were advanced with truck-mounted drill rigs under subcontract to WESTON using 4-inch-inside-diameter hollow-stem auger. The drilling was accomplished under the continuous observation of an engineering geologist from our firm. Detailed field logs were prepared of each boring.

Samples were obtained on 2-1/2- to 5-foot depth intervals using the Standard Penetration Test (SPT) procedure and 30-inch sampler driven with a 140-pound hammer. The Standard Penetration Test procedure as described in ASTM D 1587, was used to obtain disturbed samples. A standard 2-inch-outside-diameter, split-spoon sampler is driven into the soil a distance of 18 inches using a 140-pound hammer, free-falling 30 inches. The number of blows required to drive the sampler the last 12 inches is the Standard Penetration Resistance. This resistance, or blow count, provides a measure of the relative density of granular

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soils and consistency of cohesive soils. The blow counts are plotted on the boring logs at the respective sample depths. The boring logs are presented on Figures A-3 through A-5.

Hand-Auger Borings

A total of four hand-auger borings, designated B-1 through B-4, were drilled from on 17 and 18 April 1990. The borings were completed to depths of 6 to 10 feet below the ground surface. The borings were advanced with a hand auger. The drilling was accomplished under the continuous observation of an engineering geologist from our firm. Detailed field logs were prepared of each boring.

Grab samples were collected from 1- or 2-foot depth intervals throughout each boring and composited into a single sample from each boring that was submitted for analysis.

Surface Soil Sampling

Five composite surface soil samples were collected at the locations shown on Figure 2. Samples were collected from the 0 to 6-inch depth interval using a stainless steel hand trowel. Each composite sample was composed of three discrete subsamples.

Sampling

Soil samples were recovered from the split-barrel sampler, sampling trowel or hand-auger bit field classified using the Unified Soil Classification System (USCS) and placed in appropriate sample bottles provided by Laucks testing Laboratories and taken to Laucks laboratory for testing. The sample containers were pre-cleaned in accordance with the procedures in Specifications and Guidance for the Preparation of Contaminant-Free Sample Containers (U.S. EPA April, 1989). The sampler was then cleaned in an alconox detergent solution and rinsed with deionized water (Modified WESTON SOP 1.6).

Groundwater was sampled by bailer following well development. The wells were additionally purged of 3 to 5 casing volumes immediately prior to sampling.

Soil and groundwater samples were labeled, placed in coolers with ice, and delivered to Laucks Testing Laboratories for analysis. A chain-of-custody form was included with each sample shipment (WESTON SOP 1.3).

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS					SOIL DESCRIPTIONS
COARSE GRAINED SOILS MORE THAN HALF IS LARGER THAN NO. 200 SIEVE	GRAVELS MORE THAN HALF COARSE FRACTION IS RETAINED ON THE NO. 4 SIEVE SIZE	CLEAN GRAVELS WITH LESS THAN 12% FINES	GW		WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES
			GP		POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES
		GRAVELS WITH OVER 12% FINES	GM		SILTY GRAVELS, POORLY GRADED GRAVEL-SAND-SILT MIXTURES
			GC		CLAYEY GRAVELS, POORLY GRADED GRAVEL-SAND-CLAY MIXTURES
	SANDS MORE THAN HALF COARSE FRACTION PASSES THE NO. 4 SIEVE SIZE	CLEAN SANDS WITH LESS THAN 12% FINES	SW		WELL GRADED SANDS, GRAVELLY SANDS
			SP		POORLY GRADED SANDS, GRAVELLY SANDS
		SANDS WITH OVER 12% FINES	SM		SILTY SANDS, POORLY GRADED SAND-SILT MIXTURES
			SC		CLAYEY SANDS, POORLY GRADED SAND-CLAY MIXTURES
FINE GRAINED SOILS MORE THAN HALF IS SMALLER THAN NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50		ML		INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL		INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS
			OL		ORGANIC CLAYS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50		MH		INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH		INORGANIC CLAYS OF HIGH PLASTICITY
			OH		ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			PT		PEAT AND OTHER HIGHLY ORGANIC SOILS

EXPLANATION OF SYMBOLS

LABORATORY TESTS

- Consol - Consolidation
- LL - Liquid Limit
- PL - Plastic Limit
- GS - Specific Gravity
- SA - Size Analysis
- TxS - Triaxial Shear
- TxP - Triaxial Permeability
- Perm - Permeability
- PO - Porosity
- MD - Moisture/Density
- DS - Direct Shear
- VS - Vane Shear
- Comp - Compaction

UU - Unconsolidated - Undrained
CU - Consolidated - Undrained
CD - Consolidated - Drained

CONTACT BETWEEN UNITS

- Sharp
- Gradational
- Approximate

SAMPLE TYPE

- "Undisturbed"
- Bulk/Grab
- Not Recovered

BLOWS/FOOT

Hammer is 140 pounds with 30 inch drop unless otherwise noted

- D - SPT Drive Sampler (2.0 Inch O.D.)
- T - Thin Wall Sampler (2.8 Inch Sample)
- H - Split Barrel Sampler (2.4 Inch Sample)

WATER LEVELS

- Static Water Level
- Water Level at Time of Drilling

MOISTURE DESCRIPTION

- Dry - Considerably less than optimum for compaction
- Moist - Near optimum moisture content
- Wet - Over optimum moisture content
- Saturated - Below water table, in capillary zone, or in perched groundwater

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PLATE

EXPLANATION OF BORING LOG SOIL CLASSIFICATIOII AND SYMBOLS

A-1

WESTON

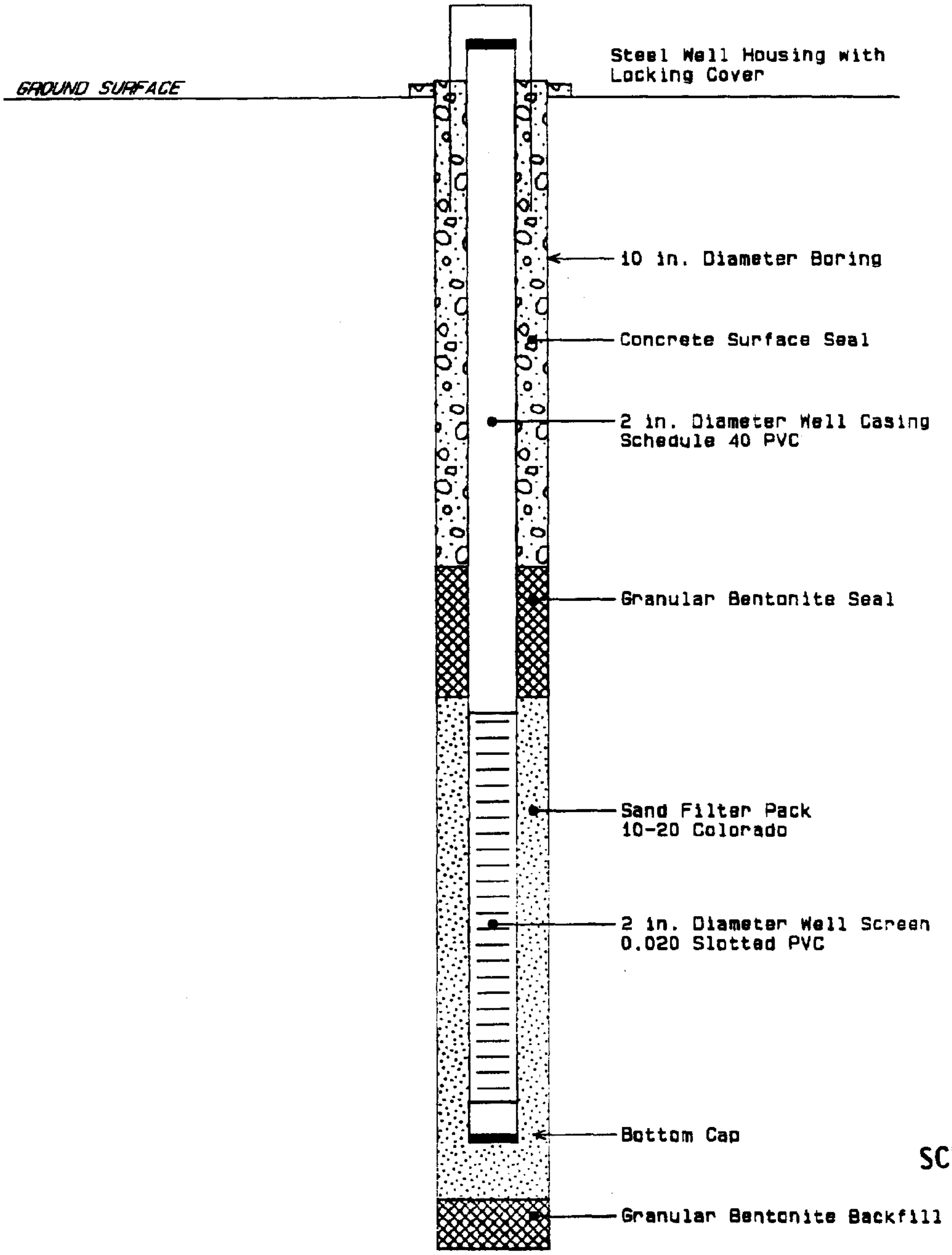
JOB NUMBER 3709-04-01

DATE MAY 1990

CTY0049867

SEA290345

WELL CONSTRUCTION DIAGRAM
Above Ground - Single Casing



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NOT TO SCALE

PLATE

A-2

WESTON

JOB NUMBER: 3709-04-01

DATE: May, 1990

CTY0049868

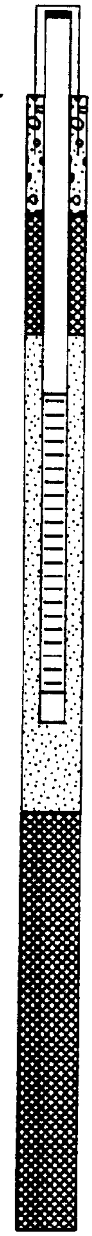
SEA290346

BORING MW-1 *(Page 1 of 1)*

CLIENT NAME Boeing-Seattle City Light

DATE DRILLED 17 April 1990

Depth (ft)	Type of Sampler	Blows per Foot	Symbols	Lithologic Description
0	D (C, L)	13	SP	SAND (SP), Brown, slightly silty, medium dense, moist, few charcoal fragments, (fill)
	D (C, L)	41	SM	SILTY SAND (SM) Black, slightly gravelly, dense, damp, (fill)
5	D (C, L)	13	ML	SILT (ML), Black, slightly sandy, stiff, damp, (fill)
	D (C, L)	16	SW	SAND (SW), Gray, well graded, medium dense, wet, (fill)
10	D	8	ML/CL	CLAYEY SANDY SILT (ML-CL), Gray and black, mottled, medium stiff, moist, trace plant and wood fragments, (native soil)
	D	4	ML	SILTY SAND (ML), Light gray and light brown, interlaminated silty sand and silty clay, soft, wet, (native soil)
15	D	25	SW	SAND (SW), Gray, well graded, medium dense, wet, (native soil)
20				



4/17/90

4/26/90

NOTE:
1. Bottom of boring 19.0'.
2. (L) indicates laboratory analysis
3. (C) indicates a composite sample

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PLATE **A-3**

WESTON

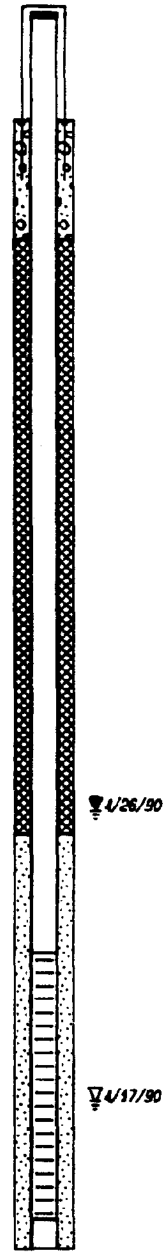
JOB NUMBER: 3709-04-01 DATE: May, 1990

BORING MW-2 *(Page 1 of 1)*

CLIENT NAME Boeing-Seattle City Light

DATE DRILLED 17 April 1990

Depth (ft)	Type of Sampler	Blows per Foot	Symbols	Lithologic Description
0	D (C, L)	6	SM	SILTY SAND (SM), Brown, becomes gray at 1.0', loose, damp, (fill)
	D (C, L)	16		
			ML	CLAYEY SILT (ML), Gray to black, slightly sandy, stiff, moist, abundant plant fragments, (fill)
5	D (C, L)	12		
			ML/CL	CLAYEY SANDY SILT (ML-CL), Gray and black, mottled, stiff, damp, abundant black organic fragments, (native soil)
	D (C, L)	11		
10			SC	CLAYEY SILTY SAND (SC), Gray, brown, black, interlaminated fine sand and clayey silt, stiff, damp, (native soil)
	D	9		
	D	6		
			SW/SM	SAND (SW-SM), Gray to brownish gray, interbedded well graded sand and silty fine sand, medium dense, wet, (native soil)
15				
	D	11		
20				



NOTE:
1. Bottom of boring 19.0'.
2. (L) indicates laboratory analysis
3. (C) indicates a composite sample

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PLATE

A-4

JOB NUMBER 3709-04-01 DATE May, 1990

CTY0049870

SEA290348

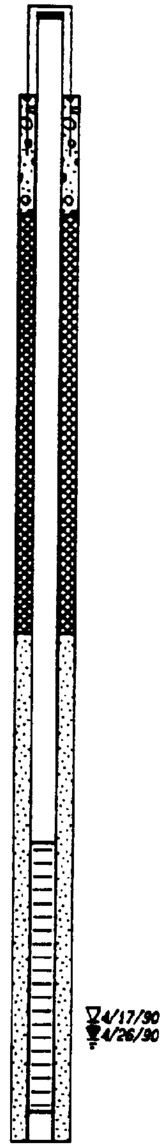
BORING MW-3 *(Page 1 of 1)*

CLIENT NAME Boeing-Seattle City Light

DATE DRILLED 17 April 1990

Depth (ft): 0, 5, 10, 15, 20

Type of Sampler	Blows per Foot	Samples	Symbols	Lithologic Description
D (C, L)	25	X	SP	SAND (SP), Brownish gray, slightly silty, medium dense, moist, abundant charcoal and wood fragments, (fill)
D (C, L)	9	X	SP	SAND (SP), Black, poorly graded, interlayered with black silty clay (1"-1' thick), loose, damp, large wood fragments, (fill)
D (C, L)	10	X	CL	SILTY CLAY (CL), Black, interlayered with dark gray well graded wet sand, stiff, damp, (fill)
D (C, L)	10	X	ML	CLAYEY SILT (ML), Brownish gray and black, mottled, slightly sandy, stiff, damp, occasional plant fragments, (native soil)
D	12	X		
			SC	CLAYEY SILTY SAND (SC), Gray to brownish gray, interlaminated silty sand and silty clay, medium dense, wet. (native soil)
D	23	X	SW	SAND (SW), Dark gray, well graded, medium dense, damp to wet, (native soil)
D	27	X		



NOTE:
1. Bottom of boring 19.0'.
2. (L) indicates laboratory analysis
3. (C) indicates a composite sample

SCL 04860

PLATE

A-5

WESTON

JOB NUMBER: 3709-04-01 DATE: May, 1990

CTY0049871

SEA290349

HAND AUGER B-1 *(Page 1 of 1)*

CLIENT NAME Boeing-Seattle City Light
DATE DRILLED 17 April 1990

Depth (ft)	Type of Sampler	Samples	Symbols	Materials Description
0			SM/SP	SILTY SAND (SM-SP), Brown, poorly graded, (loose), damp, (fill)
	(C), (L)	☒		
	(C), (L)	☒		
			OL	ORGANIC CLAYEY SILT (OL), Black, carbonaceous, (stiff), moist, wood fragments, (fill)
5	(C), (L)	☒		
			SP	SAND (SP), Dark gray, poorly graded, (loose), wet, (fill) ∇4/17/90
	(C), (L)	☒		
	(C), (L)	☒	ML	CLAYEY SILT (ML), Dark gray, mottled, (stiff), moist, (native soil)
10				
15				

NOTE:
1. Botton of hand auger boring 10.0'
2. (L) indicates laboratory analysis
3. (C) indicates a composite sample

SCL 04861

PLATE

A-6

WESTON

JOB NUMBER: 3709-04-01 DATE: May, 1990

CTY0049872

SEA290350

HAND AUGER B-2 *(Page 1 of 1)*

CLIENT NAME Boeing-Seattle City Light
DATE DRILLED 18 April 1990

Depth (ft)	Type of Sampler	Samples	Symbols	Materials Description
0			SM	SILTY SAND (SM), Brown, poorly graded, (loose), damp, (fill)
	(C), (L)	☒	SM	SILTY SAND (SM), Black, poorly graded, carbonaceous, (medium dense), damp, (fill)
	(C), (L)	☒	SP	SAND (SP), Gray, poorly graded, (loose), moist, (fill)
5	(C), (L)	☒	ML/OL	SILT (ML-OL), Black, slightly sandy, carbonaceous, (stiff), damp, becomes wet at 5.5', wood fragments, (fill)
	(C), (L)	☒	SM/SP	SAND (SM-SP), Black to dark gray, poorly graded, (loose), wet, (fill)
10	(C), (L)	☒	ML	CLAYEY SILT (ML), Dark gray, mottled (stiff), moist, (native soil)
15				

∇4/18/90

NOTE:
1. Bottom of hand auger boring 10.0'
2. (L) indicates laboratory analysis
3. (C) indicates a composite sample

SCL 04862

PLATE **A-7**

WESTON

JOB NUMBER: 3709-04-01 DATE: May, 1990

HAND AUGER B-3 *(Page 1 of 1)*

CLIENT NAME Boeing-Seattle City Light

DATE DRILLED 18 April 1990

Depth (ft)	Type of Sampler	Samples	Symbols	Materials Description
	(C), (L)	☒	ML	CLAYEY SILT (ML), Brown and gray, mottled, (stiff), moist, (fill)
	(C), (L)	☒	SM/SP	SILTY SAND (SM-SP), Brown, poorly graded, (loose), damp, (fill)
	(C), (L)	☒	SM	SILTY SAND (SM), Black, carbonaceous (medium stiff), damp to moist, wood fragments, (fill)
	(C), (L)	☒		
5	(C), (L)	☒	OL	ORGANIC CLAYEY SILT (OL), Black, carbonaceous, slightly sandy, (stiff), wet, plant fragments, (fill) ▽4/18/90
	(C), (L)	☒		
			SM	SILTY SAND (SM), Dark gray, poorly graded, (loose), wet, (fill)
	(C), (L)	☒	ML	CLAYEY SILT (ML), Gray and black, mottled, (stiff), moist, plant fragments, (native soil)
10				
15				

NOTE:
1. Bottom of hand auger boring 7.0'
2. (L) indicates laboratory analysis
3. (C) indicates a composite sample

SCL 04863

PLATE

A-8

JOB NUMBER: 3709-04-01 DATE: May, 1990

CTY0049874

SEA290352

HAND AUGER B-4 *(Page 1 of 1)*

CLIENT NAME Boeing-Seattle City Light
DATE DRILLED 18 April 1990

Depth (ft)	Type of Sampler	Samples	Symbols	Materials Description
0			SM	SILTY SAND (SM). Brown and gray, mottled, (loose), damp, blocks of gray silty clay. (fill)
	(C), (L)	☒		
	(C), (L)	☒	ML	CLAYEY SILT (ML). Brown and gray, mottled, sandy, (medium stiff), damp, (fill)
			SP	SAND (SP). Brown, slightly silty, (loose), moist, becomes wet at 3.0'. (fill)
	(C), (L)	☒		▽4/18/90
	(C), (L)	☒		
5	(C), (L)	☒	SM	SILTY SAND (SM). Dark gray, well graded, (loose), wet, wood fragments. (fill)
	(C), (L)	☒	ML	CLAYEY SILT (ML). Gray and black, mottled, (stiff), moist, (native soil)
10				
15				

NOTE:
1. Bottom of hand auger boring 6.0'
2. (L) indicates laboratory analysis
3. (C) indicates a composite sample

SCL 04864

WESTON

JOB NUMBER: 3709-04-01 DATE: May, 1990

PLATE
A-9

CTY0049875

SEA290353

APPENDIX B
ANALYTICAL RESULTS

SAMPLE ANALYSIS

Soil samples collected from the Boeing property were analyzed for base/neutral/ acid extractable organic compounds (BNA), chlorinated pesticides/PCBs, chlorophenoxyherbicides, and selected metals. Groundwater samples collected from newly installed monitoring wells were analyzed for volatile organic compounds (VOC) and conventional groundwater quality parameters.

Analyses were performed in accordance with procedures and quality control criteria described in *Test Methods for Evaluating Solid Waste*, (USEPA SW-846, 3rd Ed.) or *Methods for Chemical Analysis of Water and Wastes* (EPA-600/4-79-020, 1983 Rev.)

Samples for VOC analyses were extracted using EPA Method 5030, purge and trap, and were analyzed by gas chromatography/mass spectrometry utilizing Method 8240.

BNA and Pesticide/PCB samples were extracted either by soxhlet extraction, EPA Method 3540, or sonication, EPA Method 3550. BNA extractable compounds were analyzed by capillary column gas chromatography/mass spectrometry utilizing Method 8270 while Pesticides/PCBs were determined by method 8080, gas chromatography with electron capture detection.

Soil samples were analyzed for the chlorophenoxyherbicides 2,4-D, 2,4,5-T, and 2,4,5-TP (Silvex) utilizing EPA Method 8150.

Samples for metals analyses were analyzed either by inductively coupled plasma emission (ICP), EPA Method 6010, or by graphite furnace atomic absorption spectroscopy (GFAAS), EPA 7000 series methods, as appropriate to achieve required detection limits.

QUALITY CONTROL

Quality assurance/quality control (QA/QC) reviews of laboratory procedures were performed on an ongoing basis at the laboratory. A data validation review was performed on analytical results to ensure they met data quality objectives for the project. Data validation was based on the guidelines outlined in the *Laboratory Data Functional Guidelines for Evaluating Organic Analyses* (EPA 1988) and the *Laboratory Data Functional Guidelines for Evaluating Inorganic Analyses* (EPA 1988) modified to include specific criteria of the individual analytical methods. Results of the data validation review follow.

Sample Holding Times

All samples were extracted and analyzed within method required holding times.

Instrument Tuning, Calibration, and Performance

The laboratory reported that analytical instruments met tuning, calibration, and performance criteria for all analyses except pesticide/PCBs. Both DDT and Aldrin exceeded calibration linearity limits. No action was required since no pesticides or PCBs were detected in any samples.

Standard Retention Times

Instrument retention times of known, standard compounds are used for gas chromatographic identification of analytes in samples. Retention times should be relatively constant under a set of instrument conditions to ensure high confidence in analyte identification.

The laboratory reported that retentention time shifts met method criteria.

Detection Limits

The laboratory achieved method specified detection limits for all analytes. Reported detection limits and analytical results are adjusted for soil moisture content and any required dilution factors.

Blanks

No contaminants were detected in either laboratory method blanks or in field blanks at concentrations above the method reporting limits.

Internal Standard Recovery

Internal standard recoveries were not reported.

Surrogate Compound Recovery

Surrogates are compounds which are not expected to occur naturally in samples but are chemically similar to analytes of interest. Surrogate recoveries monitor extraction efficiency and overall analytical accuracy. Surrogate recoveries outside method limits may be a result of either sample matrix effects or laboratory deficiencies.

All surrogate compound recoveries met method specified limits.

Matrix Spike/Matrix Spike Duplicate

Matrix spikes samples are used to monitor laboratory extraction efficiency and overall analytical accuracy. Spike recoveries outside QC limits may also be indicative of a sample matrix effect. In general, spiked sample analyses are performed in duplicate so that analytical precision can also be assessed. Known amounts of analytes of interest are added or spiked into a sample. Both spiked and unspiked samples are analyzed and compound recoveries are calculated.

Matrix spike results were not reported for volatile compound analyses.

Initial matrix spike results for Dieldrin were slightly above limits for pesticide/PCB analyses. Duplicate results met criteria.

All other matrix spike and matrix spike duplicate recoveries (BNA extractables, herbicides, and metals) met method quality control criteria.

Agreement between spike and duplicate spike analyses met EPA relative percent difference criteria for all analytes though laboratory quality control ranges were exceeded for lead and cadmium.

Duplicate Sample Analysis

Laboratory duplicate sample analysis monitors laboratory precision while blind field duplicates are used to assess combined field and laboratory variability. No duplicate samples were analyzed.

DATA ASSESSMENT AND VALIDITY

Data review was performed by a senior level quality assurance chemist independent of the analytical laboratory and not directly involved in the project. Data validation was based on the guidelines outlined in the *Laboratory Data Functional Guidelines for Evaluating Organic Analyses* (EPA 1988) and the *Laboratory Data*

Functional Guidelines for Evaluating Inorganic Analyses (EPA 1988) modified to include specific criteria of the individual analytical methods.

This is to certify I have examined the analytical data and, in my professional judgement, they accurately reflect concentrations in the environmental samples submitted to the laboratory and are acceptable for use except where flagged with data qualifiers which modify the usefulness of individual values.

Roger N. McGinnis　　　　May 22, 1990

Signature　　　　Date

Roger N. McGinnis, PhD
Quality Assurance Chemist

LABORATORY RESULTS

Tabulated laboratory analytical results follow, organized by sample location, matrix, and analysis.

RFW527

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Chemistry, Microbiology, and Technical Services

RECEIVED
MAY 16 1990
ROY F. WESTON, INC.
SEATTLE OPERATIONS

CLIENT: Roy F. Weston
201 Elliott Ave. West, Suite 500
Seattle, WA 98119
ATTN: Keith Pine

LABORATORY NO. 9004297

DATE: May. 14, 1990

REPORT ON: SOIL

SAMPLE
IDENTIFICATION: Submitted 4/18/90 and identified as shown:

1) MW-1 4/17/90 0900
2) SS-5 4/17/90 0930
3) SS-4 4/17/90 1030
4) SS-3 4/17/90 1140
5) SS-2 4/17/90 1325
6) SS-1 4/17/90 1420
7) MW-2 4/17/90 1350
8) MW-3 4/17/90 1700
9) B-1 4/17/90 1530
10) B-2 4/18/90 1100
11) B-3 4/18/90 1415
12) B-4 4/18/90 1535

%

	1	2	3	4	5	6
Total Solids	84.7	93.3	91.0	91.5	91.6	92.5

	7	8	9	10	11	12
Total Solids	77.7	73.8	76.7	80.6	74.9	76.5

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Roy F. Weston

LABORATORY NO. 9004297

parts per million (mg/kg), dry basis

	1	7	8	9
Arsenic	4.9	4.2	7.5	5.9
Barium	50.	76.	67.	56.
Cadmium	1.0	1.3	1.3	0.9
Chromium	15.	17.	20.	13.
Copper	20.	36.	36.	19.
Lead	7.3	15.	16.	8.7
Mercury	0.1 U	0.1 U	0.24	0.1 U
Selenium	0.5 U	0.5 U	0.8	0.5
Silver	1. U	1. U	1. U	1. U
Tin	50. U	50. U	50. U	50. U
Sodium	1300.	2000.	2000.	1100.
Iron	20,000.	21,000.	23,000.	18,000.
Manganese	210.	240.	300.	170.

	10	11	12	Lab Blank
Arsenic	4.8	8.7	5.6	0.5 U
Barium	42.	74.	50.	2. U
Cadmium	0.5 U	1.2	0.6	0.5 U
Chromium	12.	18.	13.	1. U
Copper	17.	33.	20.	1. U
Lead	8.2	17.	7.4	1. U
Mercury	0.1 U	0.51	0.1 U	0.1 U
Selenium	0.5 U	0.5 U	0.5 U	0.5 U
Silver	1. U	1. U	1. U	1. U
Tin	50. U	50. U	50. U	50. U
Sodium	1100.	2300.	800.	90.
Iron	15,000.	23,000.	19,000.	11.
Manganese	180.	280.	210.	1. U

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LABORATORY NO. 9004297

Selected samples were analyzed in accordance with Test Methods for Evaluating Solid Waste, (SW-846), U.S.E.P.A., 1986, Method 8270 (semi-volatile extractables, base/neutrals only).

parts per billion (ug/kg), dry basis

	1	7	8	9	10
Aniline	200. U	210. U	230. U	220. U	210. U
bis(2-Chloroethyl)Ether	39. U	43. U	45. U	43. U	41. U
1,3-Dichlorobenzene	39. U	43. U	45. U	43. U	41. U
1,4-Dichlorobenzene	39. U	43. U	45. U	43. U	41. U
1,2-Dichlorobenzene	39. U	43. U	45. U	43. U	41. U
bis(2-Chloroisopropyl)Ether	39. U	43. U	45. U	43. U	41. U
N-Nitroso-Di-n-Propylamine	39. U	43. U	45. U	43. U	41. U
Hexachloroethane	79. U	86. U	90. U	87. U	83. U
Nitrobenzene	39. U	43. U	45. U	43. U	41. U
Isophorone	39. U	43. U	45. U	43. U	41. U
bis(2-Chloroethoxy)Methane	39. U	43. U	45. U	43. U	41. U
1,2,4-Trichlorobenzene	39. U	43. U	45. U	43. U	41. U
Naphthalene	79. U	86. U	90. U	87. U	83. U
4-Chloroaniline	39. U	43. U	45. U	43. U	41. U
Hexachlorobutadiene	39. U	43. U	45. U	43. U	41. U
2-Methylnaphthalene	39. U	43. U	45. U	43. U	41. U
Hexachlorocyclopentadiene	79. U	86. U	90. U	87. U	83. U
2-Chloronaphthalene	39. U	43. U	45. U	43. U	41. U
2-Nitroaniline	79. U	86. U	90. U	87. U	83. U
Dimethyl Phthalate	39. U	43. U	45. U	43. U	41. U
Acenaphthylene	39. U	43. U	45. U	43. U	41. U
2,6-Dinitrotoluene	79. U	86. U	90. U	87. U	83. U
3-Nitroaniline	200. U	210. U	230. U	220. U	210. U
Acenaphthene	39. U	43. U	45. U	43. U	41. U
Dibenzofuran	39. U	43. U	45. U	43. U	41. U
2,4-Dinitrotoluene	79. U	86. U	90. U	87. U	83. U

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Chemistry, Microbiology, and Technical Services

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LABORATORY NO. 9004297

parts per billion (ug/kg), dry basis

	1	7	8	9	10
Diethyl Phthalate	39. U	43. U	45. U	43. U	41. U
4-Chlorophenyl-Phenylether	39. U	43. U	45. U	43. U	41. U
Fluorene	39. U	43. U	45. U	43. U	41. U
4-Nitroaniline	79. U	86. U	90. U	87. U	83. U
N-Nitrosodiphenylamine	39. U	43. U	45. U	43. U	41. U
1,2-Diphenylhydrazine	79. U	86. U	90. U	87. U	83. U
4-Bromophenyl-Phenylether	79. U	86. U	90. U	87. U	83. U
Hexachlorobenzene	39. U	43. U	45. U	43. U	41. U
Phenanthrene	39. U	43. U	45. U	43. U	41. U
Anthracene	39. U	43. U	45. U	43. U	41. U
Di-n-Butyl Phthalate	39. U	43. U	45. U	43. U	41. U
Fluoranthene	39. U	43. U	45. U	43. U	41. U
Pyrene	39. U	43. U	74.	43. U	41. U
Benzidine	980. U	1100. U	1100. U	1100. U	1000. U
Butylbenzylphthalate	39. U	43. U	45. U	43. U	41. U
3,3'Dichlorobenzidine	390. U	430. U	450. U	430. U	410. U
Benzo(a)Anthracene	39. U	43. U	45. U	43. U	41. U
Chrysene	39. U	43. U	45. U	43. U	41. U
bis(2-Ethylhexyl)Phthalate	87.	160.	340.	390.	490.
Di-n-Octyl Phthalate	39. U	43. U	45. U	43. U	41. U
Benzo(b)Fluoranthene	79. U	86. U	90. U	87. U	83. U
Benzo(k)Fluoranthene	79. U	86. U	90. U	87. U	83. U
Benzo(a)Pyrene	96.	86. U	340.	140.	83. U
Indeno(1,2,3-cd)Pyrene	79. U	86. U	90. U	87. U	83. U
Dibenzo(a,h)Anthracene	79. U	86. U	90. U	87. U	83. U
Benzo(g,h,i)Perylene	79. U	86. U	90. U	87. U	83. U

SCL 04872

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Roy F. Weston

LABORATORY NO. 9004297

Samples 11 and 12 were analyzed in accordance with Test Methods for Evaluating Solid Waste (SW-846) U.S.E.P.A. 1986 Method 8270 (semi-volatile extractables).

parts per billion (ug/kg), dry basis

	11	12	Lab Blank
Phenol	44. U	43. U	33. U
Aniline	220. U	220. U	170. U
bis(2-Chloroethyl)Ether	44. U	43. U	33. U
2-Chlorophenol	44. U	43. U	33. U
1,3-Dichlorobenzene	44. U	43. U	33. U
1,4-Dichlorobenzene	44. U	43. U	33. U
Benzyl Alcohol	44. U	43. U	33. U
1,2-Dichlorobenzene	44. U	43. U	33. U
2-Methylphenol	44. U	43. U	33. U
bis(2-Chloroisopropyl)Ether	44. U	43. U	33. U
4-Methylphenol	44. U	43. U	33. U
N-Nitroso-Di-n-Propylamine	44. U	43. U	33. U
Hexachloroethane	89. U	87. U	67. U
Nitrobenzene	44. U	43. U	33. U
Isophorone	44. U	43. U	33. U
2-Nitrophenol	89. U	87. U	67. U
2,4-Dimethylphenol	44. U	43. U	33. U
Benzoic Acid	1100. U	1100. U	830. U
bis(2-Chloroethoxy)Methane	44. U	43. U	33. U
2,4-Dichlorophenol	89. U	87. U	67. U

SCL 04873

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LABORATORY NO. 9004297

parts per billion (ug/kg), dry basis

	11	12	Lab Blank
1,2,4-Trichlorobenzene	44. U	43. U	33. U
Naphthalene	89. U	87. U	67. U
4-Chloroaniline	44. U	43. U	33. U
Hexachlorobutadiene	44. U	43. U	33. U
4-Chloro-3-Methylphenol	89. U	87. U	67. U
2-Methylnaphthalene	44. U	43. U	33. U
Hexachlorocyclopentadiene	89. U	87. U	67. U
2,4,6-Trichlorophenol	89. U	87. U	67. U
2,4,5-Trichlorophenol	89. U	87. U	67. U
2-Chloronaphthalene	44. U	43. U	33. U
2-Nitroaniline	89. U	87. U	67. U
Dimethyl Phthalate	44. U	43. U	33. U
Acenaphthylene	44. U	43. U	33. U
2,6-Dinitrotoluene	89. U	87. U	67. U
3-Nitroaniline	220. U	220. U	170. U
Acenaphthene	44. U	43. U	33. U
2,4-Dinitrophenol	440. U	430. U	330. U
4-Nitrophenol	440. U	430. U	330. U
Dibenzofuran	44. U	43. U	33. U
2,4-Dinitrotoluene	89. U	87. U	67. U
Diethyl Phthalate	44. U	43. U	33. U
4-Chlorophenyl-Phenylether	44. U	43. U	33. U
Fluorene	44. U	43. U	33. U
4-Nitroaniline	89. U	87. U	67. U
4,6-Dinitro-2-Methylphenol	440. U	430. U	330. U

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Chemistry, Microbiology, and Technical Services

Roy F. Weston

LABORATORY NO. 9004297

parts per billion (ug/kg), dry basis

	11	12	Lab Blank
N-Nitrosodiphenylamine	44. U	43. U	33. U
1,2-Diphenylhydrazine	89. U	87. U	67. U
4-Bromophenyl-Phenylether	89. U	87. U	67. U
Hexachlorobenzene	44. U	43. U	33. U
Pentachlorophenol	440. U	430. U	330. U
Phenanthrene	53.	43. U	33. U
Anthracene	44. U	43. U	33. U
Di-n-Butyl Phthalate	44. U	43. U	33. U
Fluoranthene	70.	43. U	33. U
Pyrene	86.	43. U	33. U
Benzidine	1100. U	1100. U	830. U
Butylbenzylphthalate	44. U	43. U	33. U
3,3'Dichlorobenzidine	440. U	430. U	330. U
Benzo(a)Anthracene	44. U	43. U	33. U
Chrysene	44. U	43. U	33. U
bis(2-Ethylhexyl)Phthalate	440.	380.	33. U
Di-n-Octyl Phthalate	44. U	43. U	33. U
Benzo(b)Fluoranthene	89. U	87. U	67. U
Benzo(k)Fluoranthene	89. U	87. U	67. U
Benzo(a)Pyrene	250.	87. U	67. U
Indeno(1,2,3-cd)Pyrene	89. U	87. U	67. U
Dibenzo(a,h)Anthracene	89. U	87. U	67. U
Benzo(g,h,i)Perylene	89. U	87. U	67. U

SCL 04875

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Chemistry, Microbiology, and Technical Services

Roy F. Weston

LABORATORY NO. 9004297

Selected samples were analyzed in accordance with Test Methods for Evaluating Solid Waste (SW-846), U.S.E.P.A., 1986, Method 8080 (pesticides and PCB's).

	parts per billion (ug/kg), dry basis			
	2	3	4	5
alpha-BHC	8.6 U	8.8 U	8.7 U	8.7 U
beta-BHC	8.6 U	8.8 U	8.7 U	8.7 U
delta-BHC	8.6 U	8.8 U	8.7 U	8.7 U
gamma-BHC (lindane)	8.6 U	8.8 U	8.7 U	8.7 U
Heptachlor	8.6 U	8.8 U	8.7 U	8.7 U
Aldrin	8.6 U	8.8 U	8.7 U	8.7 U
Heptachlor epoxide	8.6 U	8.8 U	8.7 U	8.7 U
Endosulfan I	8.6 U	8.8 U	8.7 U	8.7 U
Dieldrin	17. U	18. U	17. U	17. U
4,4'-DDE	17. U	18. U	17. U	17. U
Endrin	17. U	18. U	17. U	17. U
Endosulfan II	17. U	18. U	17. U	17. U
4,4'-DDD	17. U	18. U	17. U	17. U
Endosulfan sulfate	17. U	18. U	17. U	17. U
4,4'-DDT	17. U	18. U	17. U	17. U
Methoxychlor	86. U	88. U	87. U	87. U
Endrin ketone	17. U	18. U	17. U	17. U
alpha-Chlordane	86. U	88. U	87. U	87. U
gamma-Chlordane	86. U	88. U	87. U	87. U
Toxaphene	170. U	180. U	170. U	170. U
Arochlor-1016	86. U	88. U	87. U	87. U
Arochlor-1221	86. U	88. U	87. U	87. U
Arochlor-1232	86. U	88. U	87. U	87. U
Arochlor-1242	86. U	88. U	87. U	87. U
Arochlor-1248	86. U	88. U	87. U	87. U
Arochlor-1254	170. U	180. U	170. U	170. U
Arochlor-1260	170. U	180. U	170. U	170. U

SCL 04876

Laucks 81
Testing Laboratories, Inc.
940 South Harney St., Seattle, WA 98108 (206) 767-5060 FAX 767-5063

Chemistry, Microbiology, and Technical Services

Roy F. Weston

LABORATORY NO. 9004297

parts per billion (ug/kg), dry basis

	6	11	12	Lab Blank
alpha-BHC	8.6 U	11. U	10. U	8. U
beta-BHC	8.6 U	11. U	10. U	8. U
delta-BHC	8.6 U	11. U	10. U	8. U
gamma-BHC (lindane)	8.6 U	11. U	10. U	8. U
Heptachlor	8.6 U	11. U	10. U	8. U
Aldrin	8.6 U	11. U	10. U	8. U
Heptachlor epoxide	8.6 U	11. U	10. U	8. U
Endosulfan I	8.6 U	11. U	10. U	8. U
Dieldrin	17. U	21. U	21. U	16. U
4,4'-DDE	17. U	21. U	21. U	16. U
Endrin	17. U	21. U	21. U	16. U
Endosulfan II	17. U	21. U	21. U	16. U
4,4'-DDD	17. U	21. U	21. U	16. U
Endosulfan sulfate	17. U	21. U	21. U	16. U
4,4'-DDT	17. U	21. U	21. U	16. U
Methoxychlor	86. U	110. U	100. U	80. U
Endrin ketone	17. U	21. U	21. U	16. U
alpha-Chlordane	86. U	110. U	100. U	80. U
gamma-Chlordane	86. U	110. U	100. U	80. U
Toxaphene	170. U	210. U	210. U	160. U
Arochlor-1016	86. U	110. U	100. U	80. U
Arochlor-1221	86. U	110. U	100. U	80. U
Arochlor-1232	86. U	110. U	100. U	80. U
Arochlor-1242	86. U	110. U	100. U	80. U
Arochlor-1248	86. U	110. U	100. U	80. U
Arochlor-1254	170. U	210. U	210. U	160. U
Arochlor-1260	170. U	210. U	210. U	160. U

SCL 04877

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Chemistry, Microbiology, and Technical Services

Roy F. Weston

LABORATORY NO. 9004297

Selected samples were analyzed in accordance with Test Methods for Evaluating Solid Waste (SW-846), U.S.E.P.A., 1986, Method 8150 (herbicides).

parts per billion (ug/kg), dry basis

	2	3	4	5	6
2,4-D	11. U	11. U	11. U	11. U	11. U
2,4,5-T	5.4 U	5.5 U	5.5 U	5.5 U	5.4 U
2,4,5-TP	5.4 U	5.5 U	5.5 U	5.5 U	5.4 U

Key

The flag "U" indicates the analyte of interest was not detected, to the limit of detection shown.

Respectfully submitted,

Laucks Testing Laboratories, Inc.

J. M. Owens

J. M. Owens

JMO:veg

SCL 04878

Laucks 82
Testing Laboratories, Inc.
940 South Harney St., Seattle, WA 98108 (206) 767-5060 FAX 767-5063

Chemistry, Microbiology, and Technical Services

Certificate

CLIENT: Roy F. Weston
201 Elliott Ave. W. Suite 500
Seattle, Wa. 98119

ATTN : Paul Frankel

Certificate of Analysis
Work Order# : 90-04-419
DATE RECEIVED : 04/27/90
DATE OF REPORT: 05/14/90
CLIENT JOB ID : 3709-04-01

Work ID : Boeing SCL
Taken By : Client
Transported by: Hand Delivered
Type : Water

SAMPLE IDENTIFICATION:

	Sample Description		Collection Date
01	4-26-MW1	Well MW-1	04/26/90 13:30
02	4-26-MW2	Well MW-2	04/26/90
03	4-26-MW3	Well MW-3	04/26/90
04	Method Blank		N/A

The flag "U" indicates the analyte of interest was not detected, to the limit of detection shown.

Unless otherwise instructed all samples will be discarded on 06/25/90

Respectfully submitted,
Laucks Testing Laboratories, Inc.

J.M. Owens

J. M. Owens

Laucks 82
Testing Laboratories, Inc.
940 South Harney St., Seattle, WA 98108 (206) 767-5060 FAX 767-5063

Certificate

Chemistry, Microbiology, and Technical Services

CLIENT : Roy F. Weston

Certificate of Analysis

Work Order # 90-04-419

TESTS PERFORMED AND RESULTS:

Analyte	Units	01	02	03
Chloride (Method 300.0)	mg/L	150.	1400.	19.
Iron (Method 236.1)	mg/L	4.8	30.	6.0
Manganese (Method 243.1)	mg/L	0.30	3.8	0.23
Sodium (Method 273.1)	mg/L	440.	1300.	210.
Sulfate as SO4	mg/L	43.	3.	15.
Total Alkalinity as CaCO3	mg/L	690.	1100.	310.

SCL 04880

Laucks 82
Testing Laboratories, Inc.
940 South Harney St., Seattle, WA 98108 (206) 767-5060 FAX 767-5063

Chemistry, Microbiology, and Technical Services

Certificate

REPORT ON SAMPLE: 9004419-01A
Client Sample ID: 4-26-MW1 Well MW-1

Date Received	: 04/27/90	Collection Date	: 04/26/90
Date Extracted	: N/A	Date Analyzed	: 04/30/90
Test Code	: LXTCVW	Test Method	: SW8240

Compound	Result (ug/L)	SDL (ug/L)	Compound	Result (ug/L)	SDL (ug/L)
Chloromethane..............	1 U	1	Bromodichloromethane.......	1 U	1
Bromomethane................	1 U	1	1,2-Dichloropropane........	1 U	1
Vinyl chloride.............	1 U	1	Trichloroethene............	1 U	1
Chloroethane................	3 U	3	Benzene....................	1 U	1
Methylene chloride.........	1 U	1	Dibromochloromethane.......	3 U	3
Acetone....................	8	5	1,1,2-Trichloroethane......	1 U	1
Carbon disulfide...........	1 U	1	Bromoform..................	1 U	1
1,1-Dichloroethene.........	1 U	1	4-Methyl-2-pentanone.......	3 U	3
1,1-Dichloroethane.........	1 U	1	2-Hexanone.................	3 U	3
trans-1,2-Dichloroethene...	1 U	1	1,1,2,2-Tetrachloroethane..	3 U	3
cis-1,2-Dichloroethene.....	1 U	1	Tetrachloroethene..........	1 U	1
Total 1,2-Dichloroethene...	1 U	1	Toluene....................	1 U	1
Chloroform.................	1 U	1	Chlorobenzene..............	3 U	3
2-Butanone.................	3 U	3	trans-1,3-Dichloropropene..	3 U	3
1,2-Dichloroethane.........	1 U	1	Ethylbenzene...............	1 U	1
1,1,1-Trichloroethane......	1 U	1	cis-1,3-Dichloropropene....	3 U	3
Carbon tetrachloride.......	1 U	1	Styrene....................	1 U	1
Vinyl acetate..............	1 U	1	Total Xylene...............	1 U	1

Surrogate Recovery Report

Surrogate Compound	Percent Recovery	Limits: Min.	Max.
1,2-Dichloroethane d4...	89	79	116
Toluene d8..............	98	85	112
p-Bromofluorobenzene....	96	82	114

* Surrogate recovery is outside of control limits. See comments.

SCL 04881

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Certificate

Chemistry, Microbiology, and Technical Services

REPORT ON SAMPLE: 9004419-02A
Client Sample ID: 4-26-MW2 Well MW-2

Date Received	: 04/27/90	Collection Date	: 04/26/90
Date Extracted	: N/A	Date Analyzed	: 04/30/90
Test Code	: LXTCVW	Test Method	: SW8240

Compound	Result (ug/L)	SDL (ug/L)	Compound	Result (ug/L)	SDL (ug/L)
Chloromethane..............	1 U	1	Bromodichloromethane.......	1 U	1
Bromomethane...............	1 U	1	1,2-Dichloropropane........	1 U	1
Vinyl chloride.............	1 U	1	Trichloroethene............	1 U	1
Chloroethane...............	3 U	3	Benzene....................	1 U	1
Methylene chloride.........	1 U	1	Dibromochloromethane.......	3 U	3
Acetone....................	5 U	5	1,1,2-Trichloroethane......	1 U	1
Carbon disulfide...........	1 U	1	Bromoform..................	1 U	1
1,1-Dichloroethene.........	1 U	1	4-Methyl-2-pentanone.......	3 U	3
1,1-Dichloroethane.........	1 U	1	2-Hexanone.................	3 U	3
trans-1,2-Dichloroethene...	1 U	1	1,1,2,2-Tetrachloroethane..	3 U	3
cis-1,2-Dichloroethene.....	1 U	1	Tetrachloroethene..........	1 U	1
Total 1,2-Dichloroethene...	1 U	1	Toluene....................	1 U	1
Chloroform.................	1 U	1	Chlorobenzene..............	3 U	3
2-Butanone.................	3 U	3	trans-1,3-Dichloropropene..	3 U	3
1,2-Dichloroethane.........	1 U	1	Ethylbenzene...............	1 U	1
1,1,1-Trichloroethane......	1 U	1	cis-1,3-Dichloropropene....	3 U	3
Carbon tetrachloride.......	1 U	1	Styrene....................	1 U	1
Vinyl acetate..............	1 U	1	Total Xylene...............	1 U	1

Surrogate Recovery Report

Surrogate Compound	Percent Recovery	Limits: Min.	Max.
1,2-Dichloroethane d4...	95	79	116
Toluene d8.............	100	85	112
p-Bromofluorobenzene....	98	82	114

* Surrogate recovery is outside of control limits. See comments.

SCL 04882

Laucks 82
Testing Laboratories, Inc.
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Chemistry, Microbiology, and Technical Services

Certificate

REPORT ON SAMPLE: 9004419-03A
Client Sample ID: 4-26-MW3 Well MW-3

Date Received	: 04/27/90	Collection Date	: 04/26/90
Date Extracted	: N/A	Date Analyzed	: 04/30/90
Test Code	: LXTCVW	Test Method	: SW8240

Compound	Result (ug/L)	SDL (ug/L)	Compound	Result (ug/L)	SDL (ug/L)
Chloromethane..............	1 U	1	Bromodichloromethane.......	1 U	1
Bromomethane...............	1 U	1	1,2-Dichloropropane........	1 U	1
Vinyl chloride.............	1 U	1	Trichloroethene............	1 U	1
Chloroethane...............	3 U	3	Benzene....................	1 U	1
Methylene chloride.........	1 U	1	Dibromochloromethane.......	3 U	3
Acetone....................	5 U	5	1,1,2-Trichloroethane......	1 U	1
Carbon disulfide...........	1 U	1	Bromoform..................	1 U	1
1,1-Dichloroethene.........	1 U	1	4-Methyl-2-pentanone.......	3 U	3
1,1-Dichloroethane.........	1 U	1	2-Hexanone.................	3 U	3
trans-1,2-Dichloroethene...	1 U	1	1,1,2,2-Tetrachloroethane..	3 U	3
cis-1,2-Dichloroethene.....	1 U	1	Tetrachloroethene..........	1 U	1
Total 1,2-Dichloroethene...	1 U	1	Toluene....................	1 U	1
Chloroform.................	1 U	1	Chlorobenzene..............	3 U	3
2-Butanone.................	3 U	3	trans-1,3-Dichloropropene..	3 U	3
1,2-Dichloroethane.........	1 U	1	Ethylbenzene...............	1 U	1
1,1,1-Trichloroethane......	1 U	1	cis-1,3-Dichloropropene....	3 U	3
Carbon tetrachloride.......	1 U	1	Styrene....................	1 U	1
Vinyl acetate..............	1 U	1	Total Xylene...............	1 U	1

Surrogate Recovery Report

Surrogate Compound	Percent Recovery	Limits: Min.	Max.
1,2-Dichloroethane d4...	91	79	116
Toluene d8.............	99	85	112
p-Bromofluorobenzene....	98	82	114

* Surrogate recovery is outside of control limits. See comments.

SCL 04883

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Chemistry, Microbiology, and Technical Services

Certificate

REPORT ON SAMPLE: 9004419-04A
Client Sample ID: Method Blank

Date Received : 04/27/90
Date Extracted : N/A
Test Code : LXTCVW

Collection Date :
Date Analyzed : 04/30/90
Test Method : SW8240

Compound	Result (ug/L)	SDL (ug/L)
Chloromethane	1 U	1
Bromomethane	1 U	1
Vinyl chloride	1 U	1
Chloroethane	3 U	3
Methylene chloride	1 U	1
Acetone	5 U	5
Carbon disulfide	1 U	1
1,1-Dichloroethene	1 U	1
1,1-Dichloroethane	1 U	1
trans-1,2-Dichloroethene	1 U	1
cis-1,2-Dichloroethene	1 U	1
Total 1,2-Dichloroethene	1 U	1
Chloroform	1 U	1
2-Butanone	3 U	3
1,2-Dichloroethane	1 U	1
1,1,1-Trichloroethane	1 U	1
Carbon tetrachloride	1 U	1
Vinyl acetate	1 U	1
Bromodichloromethane	1 U	1
1,2-Dichloropropane	1 U	1
Trichloroethene	1 U	1
Benzene	1 U	1
Dibromochloromethane	3 U	3
1,1,2-Trichloroethane	1 U	1
Bromoform	1 U	1
4-Methyl-2-pentanone	3 U	3
2-Hexanone	3 U	3
1,1,2,2-Tetrachloroethane	3 U	3
Tetrachloroethene	1 U	1
Toluene	1 U	1
Chlorobenzene	3 U	3
trans-1,3-Dichloropropene	3 U	3
Ethylbenzene	1 U	1
cis-1,3-Dichloropropene	3 U	3
Styrene	1 U	1
Total Xylene	1 U	1

Surrogate Recovery Report

Surrogate Compound	Percent Recovery	Limits: Min.	Max.
1,2-Dichloroethane d4	92	79	116
Toluene d8	100	85	112
p-Bromofluorobenzene	100	82	114

* Surrogate recovery is outside of control limits. See comments.

SCL 04884

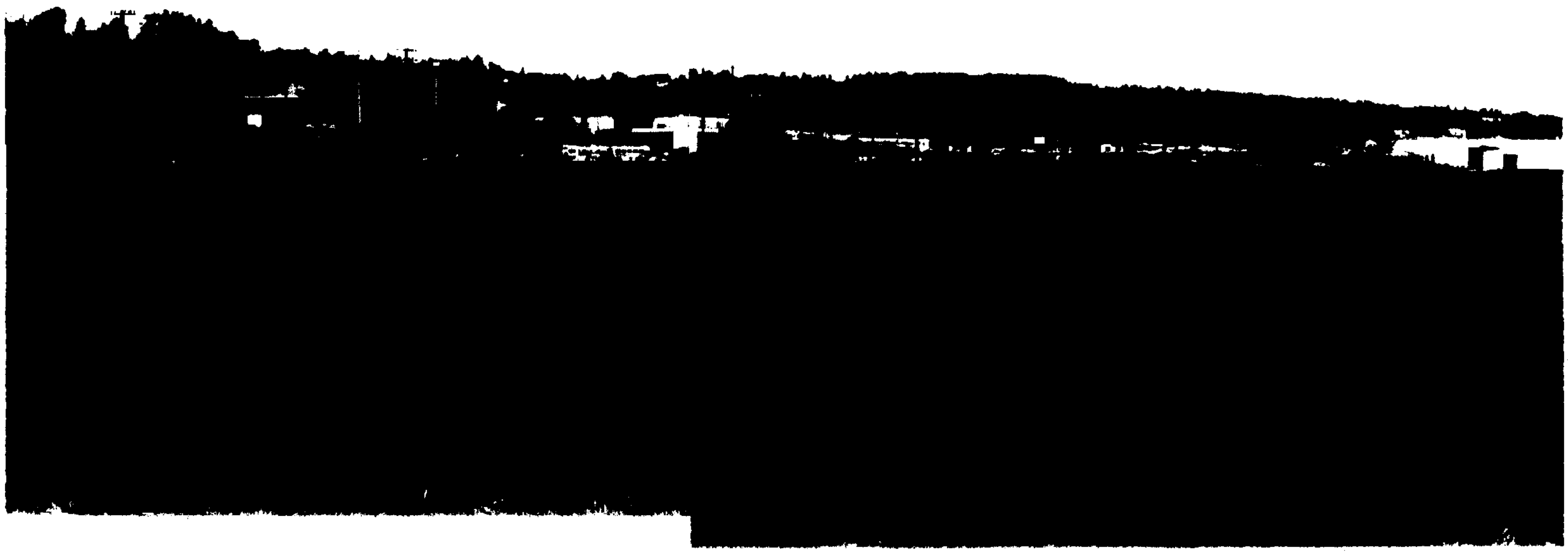
Photographic Log
Boeing - Seattle City Light
Baseline Soil and Groundwater Quality Assessment
26 April 1990

Photo 1. SCL property shoreline along Duwamish waterway (looking north).

Photo 2. SCL property shoreline along Duwamish waterway (looking south).

SCL 04885

Photographic Log
Boeing - Seattle City Light
Baseline Soil and Groundwater Quality Assessment
26 April 1990



Photos 3 and 4. Panorama of west portion of SCL property (looking west).

Photographic Log
Boeing - Seattle City Light
Baseline Soil and Groundwater Quality Assessment
26 April 1990

Photo 5. SCL substation adjoining SCL property (looking south).

Photo 6. Typical monitoring well completion - Well MW-3
(looking northeast).

Photographic Log
Boeing - Seattle City Light
Baseline Soil and Groundwater Quality Assessment
26 April 1990

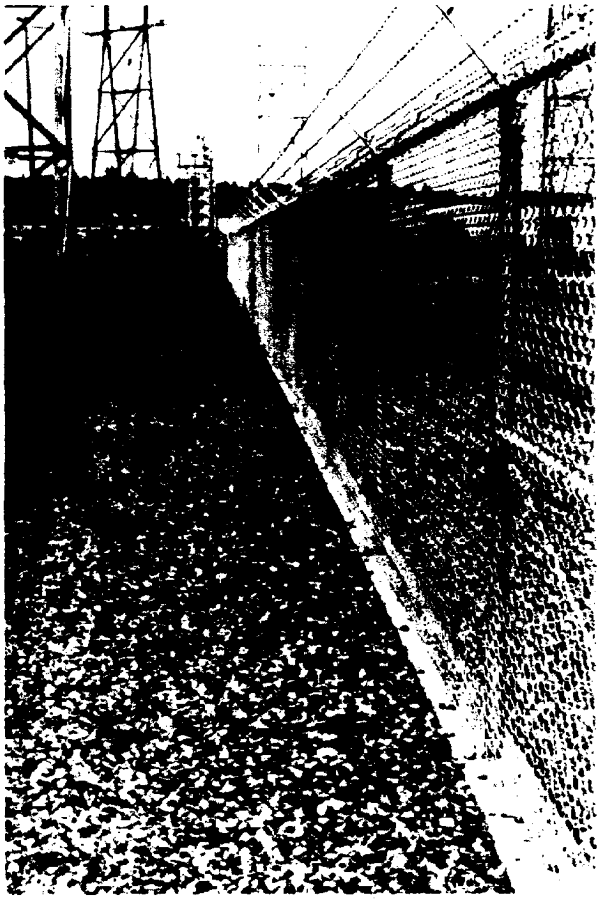


Photo 7.
Surface soil sample location area along SCL substation fenceline (looking east).

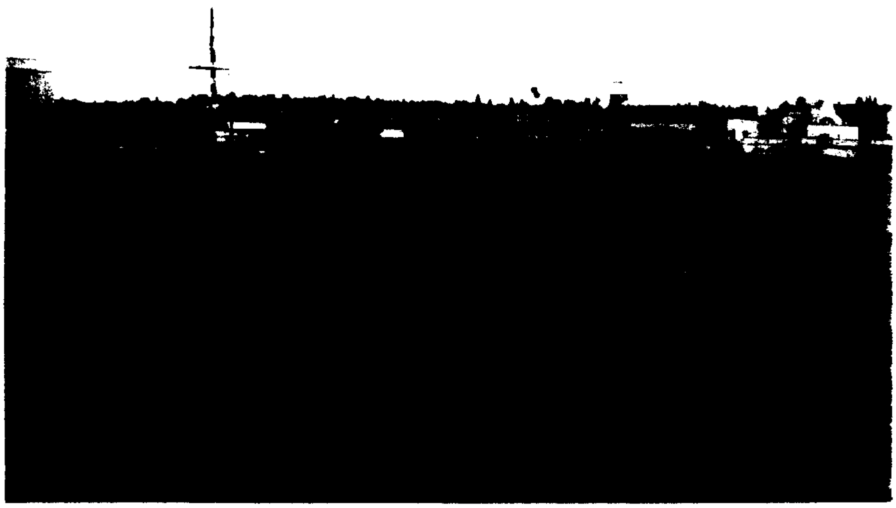


Photo 8. 1985 dredge fill area, east portion of SCL property (looking northeast).

SCL 04888

CTY0049899

SEA290377